APRIL, 1907. Vol. LI. No. 350.

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To whom all communications should be addressed.

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On receipt of this order please pay to Secretary, Royal United Service Institution, or order, my subscription to that Institution (according to the terms above).

*Name in full.*

*Rank, Ship, or Regiment.*

*Address to which Journals and other communications should be sent.*

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The Journal, published monthly, is sent post free to all members. It contains the lectures given in the Theatre, articles on professional subjects, naval and military notes, book notices, &c.

# Mr. E. Carlisle, M.A. (Cantab.)

AND

# Major M. H. Gregson, late R.E.

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***RECENT SUCCESSES INCLUDE–***

## STAFF COLLEGE, AUGUST, 1906.

The following Officers, whose names are arranged in regimental order, were successful from us at the recent Competitive Examination for admission to the Staff College:—

Capt. C. Evans, R.F.A.
Capt. G. C. Merrick, D.S.O., R.G.A.
Capt. W. H. Moore, D.S.O., R.G.A.
Capt. J. P. Mackesy, R.E.
Capt. B. W. B. Bowdler, R.E.
Capt. F. D. Farquhar, D.S.O., Coldstream Gds.
*Capt. R. G. Parker, Royal Lancaster Regt.
Capt. G. N. T. Smyth-Osbourne, Devonshire R.
Capt. V. H. M. de la Fontaine, East Surrey R.
Capt. and Brev. Major F. R. Hicks, Hamps. R.
Capt. H. S. Williams, Dorsetshire Regt.
Capt. B. D. L. G. Anley, D.S.O., Essex Regt.
Capt. R. S. Hamilton-Grace, Durham L.I.
*Capt. H. F. Baillie, Seaforth Highlanders.
Capt. P. S. Allen, Gordon Highlanders.
Capt. J. K. Cochrane, Leinster Regt.
Capt. R. L. Ricketts, Indian Army.
Capt. W. K. Bourne, Indian Army.
Capt. F. W. Lumsden, Royal Marine Artillery.

And the following received nominations:—

Captain H. C. Bickford, 6th Dragoon Gds.
Captain C. J. C. Grant, Coldstream Gds.
Captain W. D. Wright, V.C., R.W. Surrey R.
Captain C. H. Harington, D.S.O., Liverpool R.
Captain H. Wake, D.S.O., K.R.R. Corps.
Captain and Brev. Major N. J. G. Cameron, Cameron Highlanders.
Captain G. P. Grant, D.S.O., Indian Army.

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## SANDHURST, JUNE, 1906.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| FIRST | ... | A. G. Armstrong ... | 5,541 | 129th | ... | R. P. T. Ffrench ... | 3,827 |
| 48th ... | .. | H. G. Gauntlet ... | 4,515 | 181st | ... | C. W. Molony ... | 3,445 |
| 67th ... | ... | D. Macdonald ... | 4,299 | 186th | ... | P. J. I. Synnott ... | 3,386 |
| 89th ... | ... | W. G. Bagot-Chester | 4,115 | 190th | ... | R. M. Aylmer ... | 3,339 |
| 90th ... | ... | A. G. Ottley... ... | 4,109 | 197th | ... | O. Gough ... ... | 3,262 |
| 93rd ... | ... | A. P. Williams-Freeman | 4,094 | 201st | ... | P. W. J. A. Stomm | 3,151 |
| 115th | ... | D. M. Black ... ... | 3,940 | 213th | ... | B. W. Molony ... | 2,881 |
| 125th | ... | W. J. King-King ... | 3,846 | | | | |

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## WOOLWICH, JUNE, 1906.

31st ... .. ... ... ... J. S. Barkworth ... ... .. ... .. 6,483

DECEMBER, 1905.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SECOND | ... | H. G. MacGeorge ... | 7,196 | 16th ... | ... | R. Crofton ... ... | 6,330 |
| FOURTH | ... | G. Walton ... ... | 7,046 | 45th ... | ... | D. Stephenson ... | 5,899 |
| FIFTH | ... | H. A. Cox ... ... | 6,967 | 54th ... | ... | J. Kennedy ... ... | 5,711 |

This was the First Examination under the new regulations, and our pupils secured THREE out of the first FIVE places.

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## MILITIA COMPETITIVE, MARCH, 1906.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A. E. Hardy ... | ... | ... | ... | 2,304 | W. F. Anderson | ... | ... | ... | 1,947 |
| N. H. Hutcheson | ... | ... | ... | 2,105 | D. C. Robinson... | ... | ... | ... | 1,879 |
| *F. D. Frost ... | ... | ... | ... | 1,949 | F. A. Bowring ... | ... | ... | ... | 1,876 |

* Read partly at the Army College, Aldershot.

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## ARMY QUALIFYING, 1906.

NINETEEN PASSED FROM US.

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**Special Arrangements have been made for the next Examination.**

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ation.

THE BARR AND STROUD RANGEFINDER. FQ. TYPE. 9 FT. (2·74 METRE) BASE.

ON MOUNTING NM TYPE.

FOR USE ON BOARD BATTLE-SHIPS AND CRUISERS.

The Rangefinder is mounted on roller bearings, and controlled in altitude by the observer's left hand. It is controlled in azimuth by the breast-piece, which is mounted on a bracket. The bracket runs on ball-bearings.

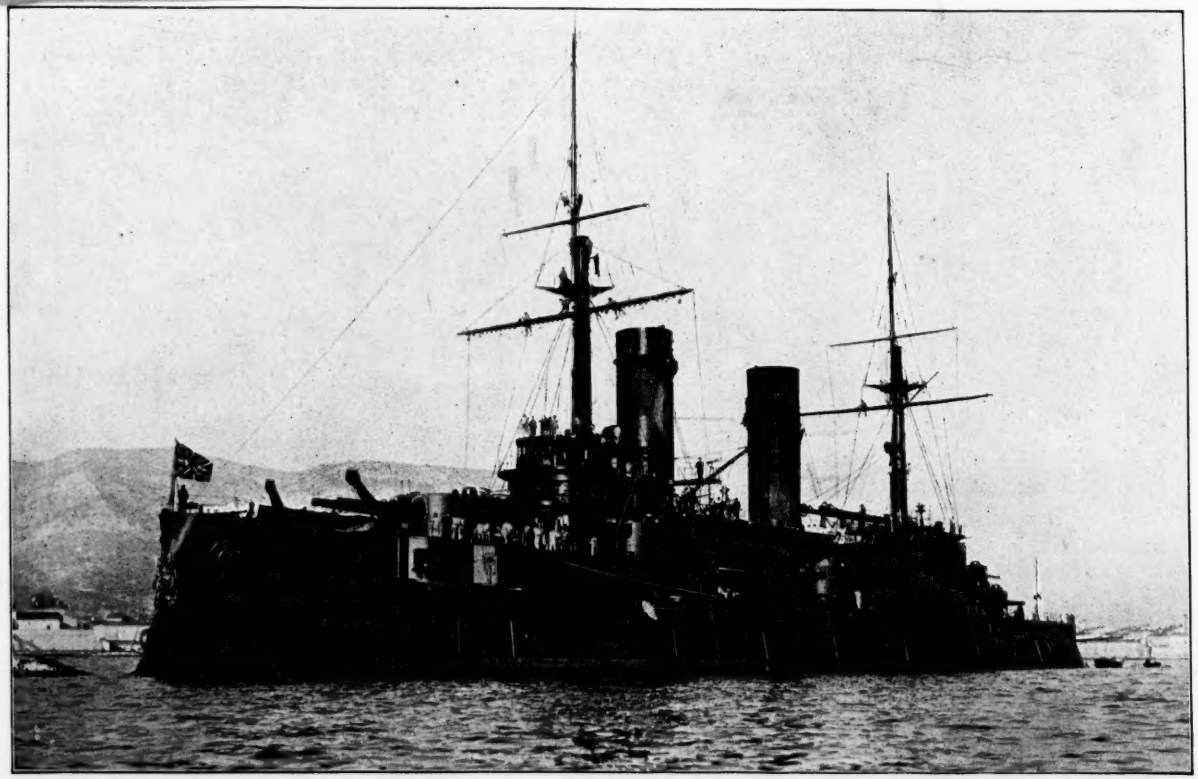
The mounting can be raised or lowered to suit the height of the observer, and is constructed entirely of gun-metal.

This Rangefinder is also supplied on a mounting suitable for use in fortresses.

Approximate uncertainty of observation :—

| | | |
|---|---|---|
| 1 yard | at 1,000 | yards. |
| 8 yards | at 3,000 | ,, |
| 20 | 5,000 | ,, |
| 190 | 15,000 | ,, |

BARR AND STROUD,
ANNIESLAND,
GLASGOW.



THE NEW RUSSIAN FIRST-CLASS BATTLE-SHIP "SLAVA"; 13,516 Tons; 16,800 I.H.P.; Speed, 18 Knots.

ARMOUR PROTECTION.—Complete Krupp Steel Belt, 9 inches amidships tapering to 4 inches at ends; Upper Belt, 6 inches to 4 inches, does not cover main deck. Below belt to turn of bilge is 4-inch H.N. steel from bow to after magazine, as protection against torpedoes. Below protective belt to bilge on each side are fore and aft bulkheads of 4-inch Krupp steel. Protective deck, 3 inches and 4 inches on slopes; Splinter deck, flat on top of belt, 2 inches. Heavy Gun Turrets, 11-inch with 10-inch hoists; secondary turrets, 6-inch with 5-inch hoists; 12-pounder casemates, 2-inch. 161 water-tight comartments.

ARMAMENT.—Four 12-inch guns in pairs in turrets; Twelve 6-inch Q.F. guns in secondary turrets on bow, beam, and quarter; Twenty 12-pounder Q.F. in casemates, with twenty 3-pounders and eight 1-pounders, with six torpedo-tubes, one submerged on each bow, one on each beam behind armour, one above water in bow and one above water in stern.

*J. J. K. & Co., Ltd., London.*

# THE JOURNAL
OF THE
# ROYAL UNITED SERVICE INSTITUTION.

VOL. LI. APRIL, 1907. No. 350.


[*Authors alone are responsible for the contents of their respective Papers*].

## SECRETARY'S NOTES.

1. Major-General Sir G. H. Marshall, K.C.B., has been elected Chairman of the Council for the year 1907-8, vice Admiral Sir R. H. Harris, K.C.B., K.C.M.G.

2. Admiral of the Fleet The Lord Walter Kerr, G.C.B., has been elected Vice-Chairman, vice Major-General Sir G. H. Marshall, K.C.B

3. The following officers joined the Institution during the month of March:—

Lieutenant J. Dare, Loyal North Lancashire Regiment.
Major The Viscount Hampden, late 10th Hussars.
Major-General Sir E. R. Elles, G.C.I.E., K.C.B.
Captain B. F. Burnett Hitchcock, Notts and Derbyshire Regiment.
Captain D. H. Blunt, Devonshire Regiment.
Lieutenant C. W. Burleigh, R.N.R.
Captain J. C. H. Newman, Essex Regiment.
Major A. Arthur, Q.O. Royal Glasgow I.Y.
Captain C. C. Pearson, Oxfordshire Light Infantry.
Lieutenant J. L. Marsh, 1st V.B. York and Lancaster Regiment.
Colonel D. Laidlaw, 1st Lanark R.E. (Vols.)
Gentleman-Cadet R. G. Purcell, Royal Military Academy.
Lieutenant A. B. Rose, Manchester Regiment.
Lieutenant O. H. Hanson, R.N.V.R.
Sub-Lieutenant A. H. Taylor, R.N.
Second Lieutenant J. Bullough, Coldstream Guards.
Lieutenant R. F. Clothier, Indian Army.

(No officer of the Militia joined the Institution during the month.)

4. The following list of the Gold Medallists of the Institution is published for general information:—

### CHESNEY GOLD MEDAL.

1900. Captain A. T. Mahan, United States Navy.

## ROYAL UNITED SERVICE INSTITUTION GOLD MEDAL.

(With rank of officers at the date of the Essay.)

1874. Captain H. W. L. Hime, R.A.
1875. Commander G. H. U. Noel, R.N.
1876. Lieutenant J. F. G. Ross of Bladensburg, Coldstream Guards.
1877. No Medal awarded.
1878. Major T. Fraser, R.E.
Captain E. Clayton, R.A.
1879. Captain The Hon. E. R. Fremantle, C.B., C.M.G., A.D.C., R.N.
1880. Captain J. K. Trotter, R.A.
1881. Captain L. Brine, R.N.
1882. No Medal awarded.
1883. Captain C. Johnstone, R.N.
1884. Captain G. T. Browne, Northamptonshire Regiment.
1885. Lieutenant F. C. D. Sturdee, R.N.
1886. Captain E. C. Callwell, R.A.
1887. No Medal awarded.
1888. Captain J. F. Daniell, R.M.L.I.
1889. Captain H. F. Cleveland, R.N.
1890. Captain G. E. Benson, R.A.
1891. Captain R. W. Craigie, R.N.
1892. Lieut.-Colonel J. Farquharson, C.B., R.E.
1893. Commander F. C. D. Sturdee, R.N.
1894. Major F. B. Elmslie, R.A.
1895. Commander J. Honner, R.N.
1896. Captain G. F. Ellison, Queen's Royal West Surrey Regiment.
1897. Commander G. A. Ballard, R.N.
1898. Captain W. B. Brown, R.E.
1899. Commander G. A. Ballard, R.N.
1900. No Medal awarded.
1901. Lieutenant L. H. Hordern, R.N.
1902. Major A. H. Terry, A.S.C.
1903. Lieutenant A. C. Dewar, R.N.
1904. Lieut.-Colonel C. E. D. Telfer-Smollett, 3rd Bn. South Staffordshire Regiment.
1905. Major W. C. Bridge, South Staffordshire Regiment, *p.s.c.*
1906.—Lieutenant B. E. Domvile, R.N.

5. Officers are again requested to legibly write (or print) their names when communicating officially with the staff of the Institution. On many occasions it has been found impossible to decipher signatures; also notification of change of address must be signed. Several applications have lately been received unsigned.

6. The following addition has been made to the Museum :—

Cavalry Cloak, which belonged to Captain Nolan, who fell in the Charge at Balaclava. It was given to Sir William Howard Russell, the renowned War Correspondent.—*Given by Lady Russell.*

# GOLD MEDAL PRIZE ESSAY, 1906.

*Subject*:—

"WHAT IS THE RELATIVE VALUE OF SPEED AND ARMAMENT, BOTH STRATEGICALLY AND TACTICALLY, IN A MODERN BATTLE-SHIP, AND HOW FAR SHOULD EITHER BE SACRIFICED TO THE OTHER IN THE IDEAL SHIP?"

*By Lieutenant B. E. DOMVILE, R.N.*

*Motto*:—

"*Qui Trop Embrasse Mal Etreint.*"

## INTRODUCTION.

A battle-ship is a vessel capable of taking its place in the main fighting line.

In the present day of large armoured cruisers, the line of demarcation between the battle-ship and the cruiser becomes hard to define, and no attempt will be made to do so.

Formerly the battle-ship was a vessel heavily armed and protected, and of a moderate speed, whereas the cruiser was a fast vessel, of large coal capacity, lightly armed and protected.

Nowadays, naval shipbuilding policy shows a tendency to combine all these qualities, namely, speed, endurance, armament and protection, in one type of large armoured vessel, and the battle-ship and the cruiser are so rapidly approaching one another that there is no fear of being accused of encroaching on cruiser territory whilst discussing the pros and cons of the vital matters dealt with in this essay. Nothing will be said on the subject of the soundness of the policy of possessing one type of armoured vessel in the future, but a ship will be dealt with only on her merits as a battle-ship, as already defined, and her qualities as a cruiser, where speed is a *sine qua non*, will not be considered.

The paper is divided into four parts, which, taken in the sequence mentioned below, will, it is hoped, clearly show the line of argument and the deductions therefrom.

*Part I.*—In which are separately discussed the values of speed and armament, both tactically and strategically.

*Part II.*—In which are compared the relative values of these two elements, both tactically and strategically, and in which an attempt

is made to demonstrate the reasons for giving preponderance to one or the other.

*Part III.*—In which are reviewed the lessons bearing on the subject which may be gleaned from the recent war in the Far East.

*Part IV.*—In which the subject is approached from the constructor's point of view, involving the consideration of actual weights and measurements, from the perusal of which it may be seen how the same two elements are associated in the intricate *ensemble* of the modern battle-ship, and whence may be deduced the speed and armament which can be reckoned on in the ideal ship.

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## PART I.

MOBILITY is necessary to war-ships: (1) To convey the armament from place to place—this is the strategic side. (2) To enable the armament to be used to the greatest advantage—this is the tactical side.

The higher the speed the more quickly can the gun-power be removed from one position to another to occupy a fresh strategic or tactical position.

The principal strategic advantages claimed for an admiral whose fleet possesses a superior speed to the enemy are:—

1. That he is enabled to force or to refuse action.
2. That he can choose his time and place for action, if he decides to accept it, having regard to the sun and wind and to the position of his own and the enemy's bases and reinforcements.
3. That he can follow up a victory or flee from a lost field at the conclusion of a battle.

As regards the forcing of an action, it must be borne in mind that it is necessary to get the enemy into the open sea to render it possible, and that if he is unwilling to fight an action, it is unlikely he will have left harbour, unless he is seeking, with an inferior fleet, to make a junction with a friendly fleet, or unless he is forced from his port by some strong military reason, as the Russians were forced from Port Arthur on the 10th August, 1904.

A good example of the strategic advantage of superior speed was afforded in the Grand Manœuvres which took place during the summer of the present year, and in which Sir W. May was enabled to refuse action and to rescue his numerically inferior fleet from the clutches of Sir A. Wilson's fleet. Sir A. Wilson's fleet-speed was less than that of Sir W. May's, though he had a few individual ships as fast as the latter's ships.

The assumption that the faster fleet possesses the choice of time and place for the action is theoretically sound, but in practice is very doubtful.

Battles have a way of being fought near the land, at strategic centres, and thus it happens that the land is as often as not the determining factor. For example, Togo, at Tsushima, had the advantage of the Russians in point of speed, but he joined action under disadvantageous meteorological conditions because he preferred to retain his strategic position between the Russians and their destination rather than let them pass to the northward of him, and then make use of his superior speed to force an action.

I witnessed a very striking example of the disadvantage of position during the Summer Manœuvres of the present year, where one cruiser steaming at 21 knots was enabled to defeat a cruiser of far greater gun power but of a less speed by engaging to leeward, when the latter was able to fight only two of her weather guns on account of the heavy spray breaking over the remainder. On the other hand, the lee guns of the weaker craft were all available.

The advantages of a high strategical speed to enable a victorious fleet to reap the full harvest at the conclusion of a battle are very great, in fact, no case can be imagined in which speed is of greater advantage to a battle-ship. Similarly, the advantage of speed to a beaten fleet is great, in that it is thereby enabled to seek safety in flight.

The advantages claimed and discussed above refer to what may be termed, for want of a better name, "Battle Strategy," that is to say to the strategy immediately preceding the decision to fight or avoid a fight, or immediately after the conclusion of a fight. The advantages under other strategical conditions of being able to steam from place to place at as high a speed as possible are sufficiently obvious to need but slight comment.

The faster a fleet steams the harder will it be for an enemy's scouts to locate it, and the larger will be the number of them required to keep touch with it when found. The enemy's battle fleet will have less time in which to prevent it carrying out its purpose, and if of a lower speed itself will probably be unable to defeat this purpose, whether it be junction with another fleet, arrival at a base, or any one of the hundred and one things which a fleet may require to do in time of war. In any case, a high speed means a shorter time *en route*, and nothing is ever lost by saving time.

Another advantage of a high strategical speed for a battle fleet, and one not very generally recognised, is that the fleet is much more immune from attacks delivered by torpedo craft, for the higher the fleet-speed the smaller is the angle of danger from which an attack may be expected, if it is to have reasonable prospects of success.

A division of destroyers making an attack cannot use a higher speed than 18 to 20 knots for their fleet-speed. In the case of torpedo-boats this speed is reduced to about 16 knots. If the battle fleet speed is 14 knots it is only liable to an effective attack from a direction included in an arc of 45° on each side from right ahead.

We will now turn to the tactical side of the speed question. The tactical advantages of having a speed superior to the enemy's are further to seek than the strategical advantages, and will have to be dealt with at greater length.

We will first see what are the objects at which an admiral wishes to arrive by a successful display of tactics. They may be enumerated as follows:—

(1) To fight the action at the range at which he considers his gun-fire will have its maximum power to damage the enemy relative to the latter's power to damage him.

(2) To bring the maximum gun-fire consonant with the tactical position mentioned in (1) to bear on the enemy whilst at the same time receiving the minimum from him.

(1) Is a question of space; (2) is a question of angular bearings in space, and involves the necessity of knowing the arcs of training of the guns of the two opposing fleets, so that the number of guns which can be fired on any particular bearing may be calculated. In this respect the present battle-ships of the British Navy, and indeed of all Navies, are essentially broadside ships; that is to say, that their maximum gun-fire is developed on the beam. The fire of the heavy guns of the main armament is in most cases lost owing to the guns ceasing to bear at 30° before (or abaft) the beam in the case of the after (or fore) turret. As we shall see when we come to the design of the ideal ship, this maximum development abeam is a necessity.

The position in which the admiral wishes to place the enemy is, therefore, on or near his beam, with the whole broadside of his fleet bearing.

It is now universally agreed that single line of some sort is the only practicable formation in which a fleet of modern battle-ships can be taken into action, though only as recently as last year the French fleet, under Admiral Fournier was trying group formations during its summer manœuvres, apparently without much success.

Single line is more mobile than any other formation, the principal objections to it being that only a certain number of ships can be placed in the line without unduly protracting it and making it unwieldy, and that whatever signals may be necessary take longer in traversing the line, and are more likely to be obscured by smoke, the latter being more particularly the case in line ahead.

In a large fleet a flying division working independently could probably be used with advantage, and a repeating ship out of the line would meet the second objection.

We have now arrived at the conclusion that the admiral wishes to go into action in single line, and since we have previously seen that he wants to fight a broadside action, single line ahead is the most convenient form for his purpose, and one in which his fleet is more likely to keep in station than any other. If the enemy is also in single line ahead, the ideal position in which he would like to find him, is steaming at right angles to his own course, so that he could cross ahead or astern of him and concentrate the fire from the whole of his fleet's broadside on the enemy's end ship whilst receiving only the fire from the chase guns of this ship. This is, however, pre-supposing an inferiority in the enemy's admiral in thus allowing himself to be caught at such a tactical disadvantage, and in approaching a problem of this kind it is necessary to credit each side with equal skill, whether in handling ships, controlling fire, or laying guns. If we take the enemy's fleet to be a "broadside" fleet too, the combat will probably be joined with both fleets steaming parallel to one another in line ahead.

The first thing for the admiral of a fleet to do on being warned by his cruisers of the approach of the enemy's battle fleet, is to endeavour to place his fleet in the best strategic position for the approaching fray, having regard to the weather conditions, the positions of his own and the enemy's bases, and possible reinforcements.

It is hard to define the point at which strategy may be said to cease and tactics to commence. In these days of wireless telegraphy, efficient scouting will portray to the admiral of the battle fleet the position and disposition of the enemy's fleet long before he himself

gets within sight of it. Thus Admiral Togo, speaking of his approach to the Russians before the battle of Tsushima, says:—

> "In spite of the thick mist which confined the vision to within five nautical miles, the information thus received (*i.e.*, by wireless from his cruisers) enabled me at a distance of several tens of miles to form a vivid picture in my mind of the condition of the enemy."

We will, however, consider that tactics commence when the battle fleets sight one another, say at about 20 miles apart; until the fleets arrive in contact we will term these tactics the tactics of the approach.

The tactical object of the approach is to reach the desired position for opening fire without exposing oneself in an inferior tactical position when once within the limits of long-range fire. To discuss this approach in all its possible combinations would require an unlimited amount of space.

The question that concerns us is as to whether superior speed enables its possessor to gain any advantage on the approach. With fleets well handled the answer is in the negative.

On sighting the enemy an admiral should place his ships on a line of bearing which is the same as for the reciprocal of the enemy's course, and then manœuvre them by turning them together so as to arrive in his chosen position. By assuming this formation, even if it leads him to approach in line abreast, he can gradually round his fleet up into very fine quarter line whilst still outside the limits of gun range, and can then make the final closing movement with the whole of his broadside bearing, and turn into line ahead when he has reached his desired position, though the latter movement is contingent on the enemy having also rounded up into line ahead; a larger or smaller turn may be necessary to keep the desired range.

Assuming that the admiral in command of the fleet of inferior speed is not desirous of avoiding an engagement, he can take up no position during the approach which will give him a superior distribution of fire, but he can and will see that the faster fleet does not obtain an advantage over him in this respect. This he does by turning so as to prevent his enemy from approaching him from any position except one near his beam so as not to run the risk of being enfiladed. This turning movement is at once conformed to by the admiral of the faster fleet so as not to be taken at a disadvantage himself. The final approach of two well-handled fleets, even if of unequal speed, will consist in a gradual closing in to gun range, with the fleets in very fine quarter line and parallel to one another. The approach will be made with the fleets abeam or nearly abeam of one another, so that the whole of the guns on the broadside will bear. Since the admiral of the faster fleet cannot possibly prevent his adversary from turning so as to keep him abeam, he gains no advantage from his speed on the approach.

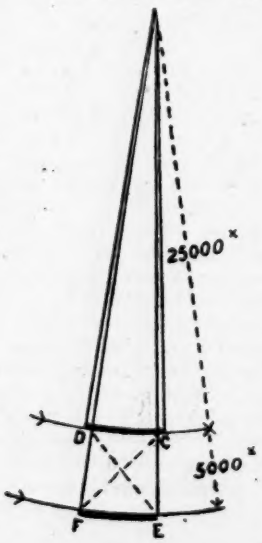
So much for the approach. We will now suppose that one admiral (A) has arrived in his chosen position for opening fire, both for distance and bearing, and that he has an advantage over the enemy (B) in point of speed, and will proceed to see how, if at all, he may turn it to good account. It may be taken for granted that neither side will indulge in any complicated manœuvres once fire has been opened on account of the difficulties they produce in controlling the gun-fire

There are two methods of procedure open to A:—

1. He may reduce speed to that of B, trusting to superior fire to give him the victory in an encounter which has now resolved itself into an artillery duel.
2. He may allow his fleet to draw ahead of B's fleet, in which case, to avoid passing out of range, he will alter course in succession towards B so as to keep all his broadsides bearing, and try to draw across B's bows to attain the ideal position previously mentioned and known as "crossing the T," at the same time putting the after guns of B's broadsides out of bearing and therefore out of action. B counters this move by turning his ships away in succession, so as to keep A's fleet on the same relative bearing, and avoid the risk of his fleet being enfiladed; the battle again resolves itself into an artillery duel, in which the two opponents are circling round on arcs of circles whose radii vary as their speeds.

We will now see if the faster fleet can claim any appreciable advantage in this concentric circle action.

DIAGRAM I.—SCALE, 1 INCH = 10,000 YARDS.




To investigate this matter a diagram has been drawn to scale showing two fleets abreast of one another and 5,000 yards apart. The faster fleet is steaming at 18 knots, and the slower at 15 knots. Each fleet consists of 12 ships at 2-cable intervals, and there is thus 4,400 yards between the leading and rear ships in either fleet.

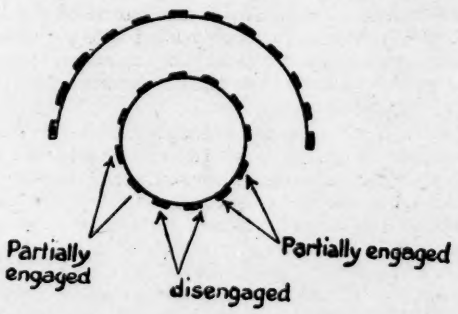
The course of the ships at any time is along the tangent to the circle at that point.

If each ship fires at her opposite number in the other line, no advantage accrues to either fleet, since each ship is firing within a degree or two of her beam.

If concentration of fire on the leading ship in each line is required, the rear ship F of the faster fleet will be firing 38° before her beam, whilst the rear ship D of the slower fleet will have to train her guns 47° before her beam, and this difference of 9° represents the maximum advantage which any one ship in the faster fleet possesses over any one ship in the slower fleet. This advantage, though possibly sufficient in the present case to make the difference between the after guns being out of bearing or not, is practically negligible, as it is excessively unlikely that concentration of fire to such an extent would be required. The case which is demonstrated is a very favourable one for the faster fleet, since it is evident their advantage increases with the number of ships in each line, the shortness of the range, and the diminution in speed ratio. To take an extreme case: If the speed ratio is 1 :2 and the range so short that the slower fleet will occupy the whole circumference of its circle, it is evident that nearly half its ships will be disengaged.

This case is shown in Diagram II.

DIAGRAM II.—SCALE, 1 INCH = 2,000 YARDS.




However, the first-mentioned case is a very favourable one in practice, as the range is not likely to be much less than 5,000 yards, the speed ratio less than 5 :6, or more than 12 ships to be placed in any line. We may safely say that for all practical purposes speed is of no advantage for enabling the admiral of the faster fleet to attain the second object of a successful display of tactics mentioned above, that is to say, a relative preponderance of gun fire.

Now let us suppose that for one reason or another the admiral (B) of the slower fleet considers that it would be to his advantage to fight at a lesser or greater range.

If the former, he will either lead off along the tangent to the circle, or will attempt to close more rapidly by turning together towards A's fleet, using an angle of turn not large enough to put his after guns out of bearing. It is quite evident that it is open to A to checkmate this move directly he discovers it by making a similar turn. If he does not wish to prevent it, and continues on his course,

he at once commences to draw ahead, and B has to turn away to avoid being enfiladed.

Should B wish to increase the range, he will turn his ships away either together or in succession. Here again it is open to A to prevent this move; if he does not do so, but continues on his course, he will draw ahead as before, but in this case B will not be placed at any disadvantage since the fleets are opening, and if this course is pursued, both fleets will pass out of gun range without either obtaining any advantage in distribution of fire.

If A wishes to alter the range at any time, it is always open to him to do so by making a suitable turn, and regulating his speed so as to keep the bearing constant. These movements B is powerless to prevent since he has the disadvantage in speed. We therefore see that superior speed does enable its possessor to control the range at which he will fight, or to realise the first object of a successful display of tactics. The slower fleet can open, if permitted to do so, without placing itself at any disadvantage, but directly it attempts to close it drops astern and has eventually to turn away again to avoid being enfiladed. Superior speed does not, however, enable its possessor to realise the second object of a successful display of tactics, that is to say a better tactical distribution of fire. With equal skill in handling the fleets on both sides, this can only be obtained by a better arrangement of the gun positions on one side or the other.

It has been mentioned previously in the course of the discussion that a large battle fleet would probably have to be divided into two parts, on account of its unwieldiness and tendency to straggle if handled as one unit; one part would form the main battle line, and the second part a flying division.

Opinions differ as to the largest number of ships which can be conveniently handled in one line, but twelve is about the limit. The question naturally arises, to what use would this flying division be put, and would a high speed be of advantage to it? The use to which it would be put would depend entirely on the relative strength of the opposing fleets. The enemy's line would, of course, be opposed by at least an equal number of ships. If he employed a wing division too, the two wings would naturally fall to one another's lot, and speed would only be of advantage in so far as has been already shown to be the case for the main fleets. If, on the other hand, the enemy had his whole strength in one line, then the wing division, acting independently would endeavour to seize a favourable opportunity to envelop his head or rear, and to place him under a cross fire. Under these circumstances a high speed would undoubtedly be an advantage.

With numerically equal opposing forces, to have one portion of the fleet of a higher speed, and to detach it to make an enveloping movement, has been tried in the Mediterranean this year, and shown to be of no use. It has been demonstrated that such ships are better kept in the main line.

The tactical advantage of speed when regarded as an actual velocity, and not in its relation to the enemy's speed, is that less time is given to the enemy in which to make up his mind how to counter any particular move, and this is an undoubted advantage to the initiator of this move.

We will now turn to the values of armament strategically and tactically

They may be briefly summarised as follows, as we will not consider the distribution of the armament at this point:—

1. Strategically.

The strategical value of being of a more powerful armament than the enemy is that concentration is forced on his fleets to a greater extent than would be the case if his ships were equally gunned to our own.

2. Tactically.

Superior armament enables us to hit the enemy harder and faster than he is hitting us, unit for unit. It also enables a fleet to be of equal offensive strength to an enemy, but more mobile by reason of containing a smaller number of units.

In the above discussion on the merits of speed and armament, the gun armament only has been mentioned, whereas there are in reality three types of offensive weapon in a modern ship—the gun, the torpedo, and the ram—of which by far the most important is the gun.

As regards the torpedo, it is a most deadly weapon in its proper sphere, the torpedo craft; it is, however, difficult to see to what use it is going to be put in a battle-ship—it is, in fact, more a potential menace than an actual danger. The common argument in favour of its retention is, that it will keep the opposing fleets at a distance outside its effective range—say 3,000 yards—and will render an attempt to ram dangerous; but in the present state of naval artillery the opportunities of using it would be so few and far between, and the results so uncertain, that the large percentage of the displacement given up to torpedo flats, etc., would be far better utilised in increasing the gun armament and its protection. Not that it is likely that future actions will be fought at nothing but long ranges, as will be seen later; but it is probable that in the mêlée of close action the chances of launching a successful torpedo are likely to be very few indeed. Of course, the doings of other nations have to be watched in this, as in all other matters, but everything considered, one submerged flat with two tubes, one on or near each beam, should suffice. At present battle-ships carry four or five tubes, and have at least two large flats. Two eminent Frenchmen, to wit, M. Lockroy and M. Bos, are strongly in favour of the abolition of torpedoes in battle-ships. Incidentally it is doubtful whether, in torpedo warfare, any advantage will be conferred on the adversary possessing superior speed, since the whole point of torpedo firing is that the ship must be turned at such an angle that the tube bears on the enemy. This is a question of angular movement; and angular velocity is independent of linear velocity. The question of getting to torpedo range naturally lies, as we have seen, with the faster fleet.

It is not proposed to discuss the ram, as it may said to be obsolete, and it is not being fitted in the most modern ships. The use of it is a danger as much to the ship ramming as to the ship rammed, and ramming would probably only be attempted by a ship in extremis, but retaining the use of her motive and directive power.

The late Admiral May said:—"No superiority of speed makes it easier to ram an opponent. A ramming encounter is a most risky performance, and when both sides have torpedoes, a fatal result is almost certain; but which side will get the worst of it is almost a toss-up."

## PART II.

We now come to the second portion of the subject which treats of the relative values of speed and armament as factors in a battle-ship's constitution.

In the first place it must be borne in mind that we have considered the individual merits of speed and armament from a theoretical or paper point of view, and that the conclusions we arrived at are likely to be modified in practice where the human element is introduced, without, however, affecting the broad principles of the argument.

For example, there is nothing harder than judging accurately the course of a hostile fleet, and it is very unlikely that absolute parallelism of the lines will be obtained. Again, the smoke and dust of an action will temporarily obscure the movements of the two fleets from one another; so, in general, the initiator of a tactical move will probably reap the tactical advantage to be obtained from this move.

We have seen in Part I. the strategic advantages claimed for a fleet capable of maintaining a high sea-speed, and these advantages are undoubted, to say nothing of the feeling of security which is lent by the knowledge of having "the legs of your opponent."

The possession of a high speed, and of the fuel to carry its owner a reasonable distance, necessarily involves some sacrifice in other directions, and the question is where is the Rubicon on the other side of which the sacrifices involved commence to outweigh the advantages?

A correspondent, writing in the *Times* of the 20th September, 1906, on this vexed question, states his case very clearly, and his views are entirely concurred in. He argues that the margin of superiority in speed within practical limits, which can only be obtained by increasing the size and cost of ships, is not sufficient to give such a correspondingly large increase in strategic value over the distances likely to be covered by our fleets in time of war, as would justify the increase in size and cost which this margin of superiority demands. In other words, a margin of speed of three knots, which a twenty-one knot fleet possesses over an eighteen knot fleet (and which represents a gain of 4 hours in every 24 hours, or in every 500 miles), is not a sufficient gain, when taking into consideration the limits of the strategical waters likely to be affected, to justify the increase in cost and size. Strategical advantage is more likely to be gained by a skilful disposition of forces acting on interior lines, and by rapid and accurate information of the enemy's movements than by a high speed of the main fighting line. Over long distances strategic advantage is more likely to be gained by the side possessing the best Intelligence Department, and the greatest facilities for coaling *en route*, than by the side which has the faster ships.

Since coal consumption varies, as the square of the speed and the horse-power as the cube, the weight of engines and boilers necessary to get the power, and the cost and amount of fuel necessary to get a sufficient radius of action, increase so rapidly at the highest speeds, that the line has to be drawn somewhere. We will consider this point again later, after consideration of the tactical side of the question.

We have seen that the extra speed of one fleet does not enable it to secure a tactically better position except in as far as the actual distance of combat is concerned.

Of what advantage is this power of controlling the range? Speed is not a weapon, it is a means of conveying the weapon—the gun—

from one place to another. How, then, is this power to be wielded to the best advantage? There is no contesting the fact that the range between the two fleets is the same for both, and it is difficult to see how a range can be found which will benefit one fleet more than another, though there need be no hesitation in saying that if this advantage in speed is used for the purpose of keeping a very long range, both fleets might just as well have stayed in harbour. Battle-fleets go to sea to come to some definite conclusion regarding one another, and, as we shall see presently, when considering the results of the late war, everything points to the fact that to successfully consummate this purpose the two opponents must arrive at some medium range—say 5,000 yards or thereabouts.

The difference in range was the main reason for the difference in the results of the battles of the 10th August, 1904, and of Tsushima, 1905.

One line of argument is, that the admiral whose fleet contains the greater number of heavy guns, will use any advantage of speed that he may possess to keep the range long, so as to inflict more damage on the enemy with his more far-reaching and accurate weapons than he will himself receive from the enemy's weapons of lighter calibre and inferior accuracy. If he does this he will probably succeed in his object, and will only himself suffer from shots which may be described as lucky or unlucky according to the point of view. All experience goes to show that the damage inflicted at these ranges will be of a superficial and not a vital nature, and, the percentage of hits growing rapidly smaller as the range increases, it would be necessary to carry an enormous supply of ammunition to get in enough blows to reduce the enemy to any appreciable extent, to say nothing of the doubtful policy of expending a large amount of ammunition, and a correspondingly large sum of money in cost of ammunition and wear to guns for such a small return.

The efficiency of fire depends not only on its precision but also, and above all, on time, or, in other words, the rate of hitting. When the projectiles are falling like hail on the hulls of vessels, they completely paralyse the occupants—blind them—prevent them from retaliating, repairing their damages, or manœuvring with sangfroid.

On the contrary, when the hitting is comparatively slow, which will happen at the long ranges, the *personnel* is enabled to pull itself together, leaks are repaired, and incipient fires are extinguished.

What did Rodjestvensky complain of at Tsushima? Not of the speed of the Japanese, but of the blinding hail of the storm of projectiles. It cannot be too strongly realised that it is the defeat of the *personnel* which is looked for, rather than the total sinking of the enemy by gunfire—a very unlikely, if not impossible, result. It may be said that an equal precision and rapidity of fire for both sides were preconceived in the argument—it was, but that does not affect its validity.

Another great lesson to be learnt from the recent war—and one not fully realised before—is the enormous loss of speed due to damage to funnels.

Suppose the faster fleet seeks safety in flight, it is nearly certain that its injured members will be overtaken by the faster craft of the slower fleet, and they must either be abandoned to the pursuers or rescued from their clutches by turning round to their aid and thus sacrificing the advantage of speed. Any delay is always in favour

of the pursuing fleet, as it is being constantly reinforced by its stragglers as they come up.

On the other hand, should the faster fleet utilise its speed to force close action, its relatively superior motion will in no way affect the result of the combat since it cannot give it a superior tactical distribution.

Thus the advantage of ordering the range of combat would seem to be an advantage only in name, and, as far as tactics are concerned, superior speed has no power to decide the fate of the day. Nothing but the gun and the state of efficiency of the *personnel* will have anything to say in the matter.

In discussing the value of armament it is necessary to consider the type of weapon we are going to put into our ships—whether they are going to be "Dreadnoughts" with only guns of the largest calibre, "King Edwards," with guns of three types, large (12-inch), medium (9·2-inch), and small (6-inch), or "Formidables," with the majority of the guns of small calibre.

This is the rock on which expert opinion is split even more than on the question of speed versus armament.

A fleet of "Dreadnoughts" in combat with a fleet of "Formidables," would presumably desire to maintain a long range action, so as to neutralise the effect of their adversaries' light artillery, by which means their heavy metal would obtain the greatest relative advantage, though, as we have seen, the effects would probably not be vital, the waste of ammunition would be large, and no definite result would be arrived at. To enable them to maintain this range they would require a higher tactical speed, or at least an equal tactical speed to their opponents. The fleet of "Formidables," on the other hand, would desire to close so as to obtain as great an advantage as possible for the majority of their guns. All history confirms the fact that this fleet will get their way, and, for a simple but convincing reason, which was mentioned when discussing the tactical value of speed. They are very likely to have caused damage to the funnels of some of the "Dreadnoughts" by their more numerous projectiles, even at the long range, as the laws of chance guarantee that some of these will reach the mark. The ships thus struck will undoubtedly suffer a loss of speed which will entail a reduction of the fleet speed, unless the laggards are going to be deserted. As pointed out before, the fleet wishing to close always has the advantage caused by any delay, as their stragglers can pick up their places in the fighting line again.

If, then, as is highly probable, the "Formidables" have their way and decrease the range, will the shower of projectiles they will pour in from their smaller guns be sufficient to paralyse the efforts of their powerful adversaries and prevent them from driving home their deadly blows? It is most probable that it will. After all, the only really competent judges are the Russians, and they all seem to be of this opinion. We ourselves can only form our judgments from target practice, and anyone who has seen a well concentrated 6-inch fire, and especially such a fire when the shots which are not hitting are falling short, must have been struck by the fact that it would be very hard to make a successful reply from guns which from their nature require a very deliberate aim.

A strong argument in favour of the retention of the small gun is, that all practice up-to-date goes to show that the 6-inch gun, though firing a projectile of less velocity and higher trajectory than does

the 12-inch gun, obtains a greater percentage of hits to rounds fired than the big gun obtains. When we take into consideration the fact that it fires five or six times as rapidly, it is well to pause for thought before giving it the go-by. The reason for the small gun being more accurate is found in this greater rapidity of fire. Since the range is, in all probability, constantly changing, when once found, it is easier to keep for a gun firing rapidly than for a gun firing at longer intervals, which may be thrown off in these intervals by an ill-judged change of range, and must be spotted for afresh after every round, instead of the immediate adjustment of a smaller error in the case of the more rapid firing weapon. Of course, it may be argued that in the "parallel fleet" action, the range will be constant, but anyone with any experience of range-keeping will know that such is not the case, and that the range is constantly undergoing changes quite large enough to throw off the fire at a long range. Another great point in favour of the light gun is, that in rough weather, or even when the motion is only slight, it becomes very difficult to accurately lay a gun controlled by power, and the fire from it is liable to become very slow and uncertain. In any case, the gun has to be fired as the roll of the ship brings the sights on, as it is impossible to keep it laid during the roll. This introduces all sorts of errors, to say nothing of the uncertain interval for which the gunlayer must allow between the pressing of his firing key and the departure of the projectile, a matter about which he learns very little in the piping times of peace, as most of his practice generally takes place in calm water. If he does happen to fire in bad weather he does not do much damage to the target. On the other hand, the 6-inch gun can be kept laid continuously unless the motion is very violent.

The figures which were quoted just now when discussing the rate of fire, are for fine weather practice. How much more, then, in bad weather, will the hand-worked gun have the advantage? In fact, there need be no hesitation in saying that in a seaway a "Dreadnought" would be worsted by a battle-ship having a battery of 6-inch guns of high command, with a few 12-inch guns to put the finishing touches at a short range, when the *personnel* is cowed and its nerve shaken by the hail of despised 6-inch shell. Is it, then, advocated that our battle-ships should be armed with nothing but the light guns? By no means. The heavy guns are necessary to penetrate the vitals of the enemy when the 6-inch gun has paralysed his fire by its persistence at the same time that it has been destroying his communications, wrecking his gun sights, and inflicting other damage of a more or less serious nature.

In what proportions are they, then, to be mixed? In the first place there should be only two calibres of guns in a battle-ship, one type of the heaviest—say the 12-inch—and the other of the heaviest that can be easily and rapidly worked by hand, namely, the 6-inch with its 100 lb. projectile, which is as much as a man can comfortably handle. The medium gun, such as the 9·2, has no place in a battle-ship, and only multiplies the types of gear required. It is an excellent weapon for the main armament of a cruiser, and should be confined to that type of vessel.

We shall see the number of guns we can mount in the ideal ship when we come to Part IV., but the proportion of the heavy guns to the light ones should be about 1 to 2, say 8 12-inch and 16 6-inch. No guns of a smaller calibre than the 6-inch should be carried, for the

following reasons:—As at present fitted, the light quick-firing guns and their mountings (not being in any way protected), are almost certain to be damaged or destroyed when the ship takes part in a day action of any magnitude.

To suitably protect them with armour would involve a lot of additional weight and space. The 6-inch guns themselves should be used to repel torpedo craft, half charges being employed to save wear to guns. In this respect there is a great future for time-fused shrapnel shell.

The 6-inch guns should be fitted with as large a type of sub-calibre gun as possible, probably a 12-pounder could be carried; these latter should be stowed at the bottom of the ammunition trunks, or other suitably protected spot, and could be used in some of the 6-inch guns by night, if thought desirable, as well as for day practices. This arrangement would be in every way suitable, as the 6-inch gun is a very handy weapon to lay and train by night. If it is thought necessary to carry more light guns on their own mountings, the latter would have to be rendered easily movable so that they could be stowed below during the day-time.

In designing a ship it is necessary to remember that if prominence is given to one of the factors that go to make up the whole, one or more of the others must suffer unless the size of the vessel is increased. This is very often lost sight of.

If, for example, a high speed is wanted, something else must be sacrificed.

What is that something going to be? Is it gun power? Then your high speed will be of use to you only to run away with. Is it armour? Then your ship is more vulnerable. Is it fuel? Then one of the necessaries of your cherished speed is cut down—a necessary which grows in ever-increasing ratio with the speed. If you can give up none of these things, the only thing left to do is to increase the size of the ship. Where, then, are you going to stop? Are you going to sacrifice numbers to size and have fewer ships? No. What, then? Money is the answer. If you want everything, speed, gun-power and numbers, you must pay for it, and so the Budget goes on growing and the ships increasing in size till it is difficult to see where the end will be.

Captain Mahan, in an article in the *National Review* for May, 1906, says:—"I am, however, distinctly of the opinion that the Will-o'-the-Wisp of higher speed is the chief cause of the present vicious circle, in which naval officers, uneasily conscious that fighting power must not be unduly sacrificed, seek refuge from the dilemma by increasing size."

He goes on to suggest that the only way of limiting the size of ships is by International agreement, and it would certainly seem, from Sir Edward Grey's speech in the House, on the "Burden of Armaments," that something of this sort would be submitted to the Hague Conference. Æsop's fable of the fox and the hen is irresistibly brought to mind, and in any case, there would probably be some difficulty in enacting a penalty from the Power who breaks the rule, and it would lead to endless quibbling. At the same time, it seems to be the only way out of a dilemma, which will go on increasing the size of its horns until, in Captain Mahan's words, "the representatives of the people will intervene, and, as usual, under such

circumstances, will do something more radical than beneficial, unless anticipated by well-weighed professional suggestion."

A great cause of the increased size of ships is the necessity of having as much gun-power as possible in a limited length of line. We have seen that a long line of ships becomes unwieldy, and in practice the number that can be conveniently handled is limited, say, to twelve ships. These ships must carry as large a number of offensive weapons as possible, which leads to big ships.

If, for the same original cost and cost of upkeep, two ships could be built of the same defensive powers and speed as one big one, but each with one half the offensive power, they would have a considerable advantage in fighting the big ship, as they could obtain concentration of their fire whilst forcing dispersion on that of the enemy. If the length of the line were not limited, we should doubtless see a larger number of smaller ships for this reason.

It is hoped that enough has been said to render the argument clear to the reader, and possibly convince him of its soundness. The gist of it will be briefly recapitulated before proceeding to discuss the design of the ideal ship.

The objective of the battle fleet must always be the enemy's fleet; the primary object in designing a ship must, therefore, be to give her as powerful a weapon of offence as possible. Speed, as I have before stated, is not a weapon of offence, it merely serves to convey the weapon of offence—the gun—from place to place. If, then, there is a question of sacrifice of either one or the other, speed must go to the wall. It is undoubtedly an advantage for the gun to be transferred from point to point as quickly as possible, but no amount of rapid movement will compensate for lack of striking force at the other end, especially since speed cannot procure any appreciable advantage for the application of the striking force. In the school of thought, of which the "Dreadnought" is the outcome, a high speed and a powerful armament are both obtained at the price of a big ship. The main armament consists solely of 12-inch guns, and for reasons already given it would be preferable to leaven these by a number of 6-inch guns.

The gun, now as ever, is going to decide the modern battle. It is not by clothing ships in impenetrable armour and giving them a high speed, with which presumably to keep a long range, that victory will be obtained. The most powerful method of defence is offence, and there can be no advantage that can be obtained by a high speed to compare with that ensured by a well directed fire, from as large a number of guns of the proper calibres as can be conveniently placed in the ships. It pays better to defeat men than armour—to capture the ship than to sink her. The moral effect of a vigorous attack well pushed home must always be enormous, and the *morale* of a fleet that wishes to maintain a long range must undoubtedly be inferior to that of a fleet in which a decisive combat is sought, an object which can only be consummated by getting to medium ranges.

The problem we have to face in designing our ideal ship is, briefly stated, as follows:—

We know approximately, from previous designs, the weights which are available for providing the ship with guns, ammunition and motion to carry the guns for a certain distance, in any given tonnage, the other components which go to make up the total weight of the vessel being

fixed at the minimum consonant with safety and comfort. The variables with which we have to deal are, therefore:—

Weight of guns and their protection.
Weight of ammunition.
Weight of engines and boilers.
Weight of fuel.

The problem before us is what percentage of the available weight to allot to each. The first thing, therefore, to decide on is the tonnage we wish to limit ourselves to. Theoretically, there is no limit to the size of the ship—if we have ships of 20,000 tons, why not ships of 40,000 tons? In practice the size of ships is limited by their cost, and to a certain extent by their handiness, draught and other similar considerations. At present there is a tendency to increase the size, a policy in which Great Britain is leading the way. Of course, one is always haunted by the thought that if you had a bigger ship you could carry more guns, but it is thought that a ship of 18,000 tons is quite a large enough basket in which to put the eggs at our disposal, and it is hoped that other Powers will not continue the "one bigger, one better" policy.

Into this ship should be placed as large a number of guns as possible within reasonable limitations, of the calibres and in the proportions already mentioned, with an adequate supply of ammunition. Engines and boilers, for a certain minimum speed, should next be allowed for, together with a sufficient supply of fuel to take the ship a certain minimum distance at economical speed. The remaining available tonnage should be taken for the provision of as adequate an armour protection as possible.

As regards the amount of ammunition that should be carried, the present allowance should be largely increased, as the recent war shows that it is not enough. 150 rounds each for the 12-inch guns, and 300 rounds each for the 6-inch guns should prove sufficient, and that is nearly double the present supply. The 12-pounders should be allowed 300 rounds each. The reduction in the torpedo armament previously mentioned will meet this extra stock of ammunition. In laying down a minimum speed to be allowed for, precedent and the doings of other Powers must be considered. It is thought that a full speed of nineteen knots is a sufficiently high speed for a battle-ship, giving as it does a useful fighting speed of sixteen knots for between two-fifths and three-fifths of the total horse-power. Of course, it may be said: "If armament is all-important, why not cut down the speed to a very low limit, say 5 knots, and cram in more guns?" The answer to this is, that there is a happy mean in all things, and in war-ship building as in any other competition you must be guided by the movements of the other competitors, and to so handicap yourself in point of speed would be foolish. It has been indicated where the line should be drawn, viz., nineteen knots.

Similarly, in selecting the amount of fuel to be carried, the doings of other nations, as well as the number and capacity of coaling stations, and the service on which the ship is likely to be employed, must be considered. Fuel fixes the endurance limit of the modern ship in the same manner as the supply of water and provisions fixed the endurance limit of the sailing-ship. In the way of coaling stations, Great Britain is exceptionally well off. At present the tendency is

to increase the distance which a ship can traverse without replenishing her bunkers, and a distance of 8,000 miles should be allowed for.

The capability of mounting the guns that our tonnage allows for depends on:—

1. The amount of right-ahead and right-astern fire that is desired.
2. The command (*i.e.*, the height above water) which it is necessary to give the guns to ensure their fighting value in all weathers.
3. The amount of clearance between guns on account of blast from the discharge of other guns.

It is evidently easier to provide a larger amount of fire on the broadside than right ahead or astern, since the ship is five or six times as long as she is broad. Similarly the effects of blast are more severely felt as the target approaches the keel line of the ship, except in the case of guns mounted in the middle line at the ends of the ship, where the blast is felt by the men stationed in the broadside gun-positions when they are trained far beyond the beam.

A large amount of end-on fire is not necessary in a battle-ship, though it is desirable in a cruiser, which is more likely to be engaged in chasing or being chased, an employment that will probably be confined, in the case of the battle-ship, to the end of a general action. Right-ahead fire is desirable, but, to provide it, numbers should not be sacrificed which might have been mounted on the broadside. For example, in the "Dreadnought" the provision of right-ahead and astern fire for the broadside turrets prohibits the possibility of mounting any other guns on the broadside.

Everything, therefore, points to the necessity of having a broadside fleet, and if this is decided, the necessity of large end-on fire becomes less, since the fleet is going to manœuvre in single line, more of the right ahead order than the abreast.

At the same time the broadside guns should be given as large an arc of fire as possible, at least, sixty degrees on each side of the beam, except in the case of guns which assist in the end-on fire, where, unless they are mounted in turrets, an arc of training of forty-five degrees beyond the beam is sufficient, since a larger arc necessitates too large an opening of port.

The big guns in the centre line should be capable of being trained forty-five degrees beyond the beam.

## PART III.

In trying to draw conclusions from recent warfare, as to the respective merits of speed and armament, it will only be necessary to refer to the Russo-Japanese War, there being no other war in which the modern capital ship took any large part on both sides.

In this war there were two notable capital ship actions, known as the battles of the 10th of August and of Tsushima.

It is not proposed to discuss the faulty strategy of the Russians at the commencement of the war, it being beside the point, but the following were the principal mistakes which led up to the battle of the 10th August:—

1. The division of the fleet between Port Arthur and Vladivostok.
2. The selection of Port Arthur instead of Vladivostok as the base of the battle fleet.
3. Port Arthur having once been selected, the subordination of the efficiency of the battle fleet to the defence of the port.

Of these 2 is open to discussion. At first sight Port Arthur would appear to occupy the better position for preventing the Japanese from entering the Yellow Sea, but it must be remembered that whichever port was chosen, there would the Japanese fleet be drawn; the latter could not start the transport of their huge army till the Russian fleet was reduced. A battle had to be fought at one place or the other, and afterwards the victorious fleet could go where it wished. In case of defeat, Vladivostok offered more security, was much more difficult to blockade, and had more accommodation for reinforcements. The port is now kept open in all seasons. Vladivostok should have been chosen for these reasons, but it is always easy to be wise after the event.

The Russians, having chosen Port Arthur, should certainly have taken some steps to secure the Elliott Islands, which formed an ideal advanced base for the Japanese, of which Togo took full advantage.

When the Russians at last left Port Arthur, on the 10th of August, 1904, they had only one object in view, and that was to avoid the enemy and make good their escape to Vladivostok, there to await in peace reinforcements from home.

The last thing they wanted was to fight an action, and this is not the spirit in which battles are won. The sortie had become unavoidable, on account of the fire to which the ships were exposed in the anchorage.

Another strong reason for making the sortie was provided by news from St. Petersburg, that the Japanese battle-ships, owing to foul bottoms, could steam no more than thirteen knots. This, needless to say, was incorrect, and is an instance of the mistake of trying to direct war from headquarters.

It would have been preferable to have tested the intelligence by feinting a sortie, and seeing how long it took Togo to come up. Instead, a day was chosen on which the state of the tide prevented the big ships from leaving the port before 8 a.m., though the destroyers and small craft commenced to leave at about 5 a.m. Togo, warned by wireless telegraphy, of the activity shown by the enemy, was enabled to leave his base in the Elliott Islands at 7.30 a.m. Here we have a very good instance of the strategic value of speed, since Togo, knowing that he had the advantage of his adversary in this respect, could lie snug in his well-chosen hiding place, secure in the knowledge that he could always prevent his enemy from getting far on their way to Vladivostok without interference.

About noon, the Russian fleet, consisting of six battle-ships, four cruisers, and some torpedo craft, steering to the S.E., sighted the Japanese First Division, consisting of four battle-ships and two armoured cruisers, on their port bow, steering to the S.W., at a distance of eight or nine miles, while the second Japanese Squadron, consisting of four cruisers, of which only one was armoured, was at a considerable distance on their starboard quarter. These were the

two most important Japanese Divisions, and Witgeft, the Russian Admiral, had a great opportunity of keeping them apart by attacking the First Division.

Though, on account of its superior speed, it could have avoided close action, it would still have been forced to retreat in a direction away from its reinforcements. The Russians would also have had the advantages, already pointed out, which belong to a fleet engaged in a stern chase. This opportunity Witgeft lost through his determination to proceed at all costs to Vladivostok, and, by hauling to the northward, enabled Togo to cross his bows, join his other division, and, owing to his superior speed, overhaul the Russians and open fire about 5.30 p.m., at 7,300 metres.

Fire had been opened once or twice before during the day, at ranges outside 8,000 metres, but, with the exception of a shell which burst on one of the "Askold's" funnels, no results were arrived at, except that a considerable amount of ammunition was thrown away at the long range.

Both fleets were steaming in parallel lines to the eastward, the Japanese being to the southward with their two divisions in line ahead. The Russians, for some reason best known to themselves, had placed their cruisers under the lee of the battle-ships on the port beam of the latter. Fire was opened when the two flag-ships, which were leading, came abreast of one another. Togo, instead of using his speed to close the enemy and obtain some definite advantage, preferred to keep a long range, with the result that from 5.30 to 6.30 no change took place. Both fleets concentrated their fire on the flag-ships, which were occasionally hit by the rain of projectiles, though no serious damage was inflicted.

The Japanese drew slightly ahead. At 6.30 a shell bursting killed Admiral Witgeft, and the signal to transfer the command to Prince Oukhtomsky, in the "Peresviet," was not taken in, probably owing to the smoke obscuring it. The "Cesarevitch," continued to lead the fleet on the same course through lack of other orders. At 7.30 a 12-inch shell exploded in her conning tower, and jammed her helm, the ship turned to port, carrying confusion into the line of cruisers, and, continuing to circle, passed round the rear of the battle fleet and approached the enemy, getting to a range of about 4,000 yards. The "Retvisan" followed to support her, and Prince Oukhtomsky, at last taking command, fled with the rest of the battle fleet in disorder for Port Arthur. The actions of the cruisers and destroyers do not concern us.

Togo, sticking to his long range policy, neglected the golden opportunity of cutting the "Cesarevitch" and "Retvisan" off from their main body. They were, however, subjected to a murderous fire for a short time, before the former succeeded in getting her steering gear into order and went after the remainder of the battle fleet, accompanied by the "Retvisan," but was, however, easily out-distanced by the latter on account of the injuries to her funnel which she had sustained, and which caused a coal expenditure of six times the normal. After dark, the "Cesarevitch," under the command of the second officer, shaped course for Vladivostok, and was subjected to several torpedo attacks, but escaped uninjured, though she did not fire, but trusted to the darkness to hide her.

The captain, Ivanov, who had been wounded, presently took charge of the ship again, and decided to take her to Tsing-Tau, where

she arrived safely the next morning and was disarmed. The remaining five battle-ships reached Port Arthur in safety, after sustaining several torpedo attacks, which produced no result.

What was the net result of the day? Of eighteen Russian vessels engaged, only one can be said to have been destroyed by gunfire as the result of this action, namely, the cruiser "Novik," which was blown up and deserted by her crew on the Japanese coast some days' later, after an attack by the cruisers "Chitose" and "Tsushima."

Of all the Russian ships, the "Cesarevitch" suffered the most damage. She had been the sole object of the enemy's attack during all the latter part of the day, first when flying the flag of Admiral Witgeft, and afterwards when the injuries to her steering gear caused her to approach the Japanese line. All the early reports represented her as being in the most pitiable condition. In reality, not a single armour plate was pierced, not a gun was dismounted, her rudder and engines were intact, and she had only eight killed and twenty-two wounded—far less than the "Mikasa's" casualties. The only serious injury was that to one of her funnels, and the only other shots worth counting were those which killed the admiral and jammed the steering gear.

There was no reason why she should not have proceeded on her way to Vladivostok—she had plenty of ammunition and enough coal. In fact, with mutual support there was no reason why the whole Russian fleet should not have accomplished their object, instead of returning to the death-trap they had left, or being disarmed in neutral ports. To explain their defeat, it is no good to count up the number of ships and guns engaged on either side, since to neither can the victory be ascribed. It was the moral factor which decided the day. The element of disorganisation, which had been maturing in the Russian fleet ever since the first surprise on the 8th of February, had by now assumed large proportions. To this cause, and to this cause alone, can be attributed the actual far-reaching results.

What, then, are the lessons we can learn from this battle? We see that a fight conducted at a long range leads to no conclusive results, and only to the useless expenditure of a large quantity of ammunition. The arrangements for controlling the fire in both fleets were very crude, and an enormous advance has been made in this direction since that date, but the results obtained from this control are not sufficiently good to make it probable that a decisive action will be fought at a long range, to say nothing of the fact that these results are made at a moored target, and not at a target that is travelling fast and firing back at you. It is probably owing to this large expenditure of ammunition that the Japanese relinquished the pursuit when they did, instead of following up their advantage, and they would have been unable to renew the combat on the next day if the Russians had elected to continue their journey to Vladivostok. This also points to the fact that a larger amount of ammunition should be carried than is now the custom.

We see the advantage that Togo reaped from having a faster fleet. His superior speed enabled him to await his reinforcements, and then pursue and force action on the reluctant Russians, and also to select his range. Whether he selected it rightly or wrongly is a matter of opinion; his was not, however, a policy which would have recommended itself to Nelson, had he lived in these days, but savours more of the French tactics in the days of Rodney.

The Japanese undoubtedly lost an opportunity in not cutting off the "Retvisan" and "Cesarevitch," as their speed would have enabled them to do, thus forcing the remainder to definitely abandon them or turn and reinforce them, but, as just mentioned, it may have been lack of ammunition which forced Togo to forego his prey. He was undoubtedly influenced in his reluctance to close the enemy by the knowledge that he had no reserve of ships to fall back on, and so he relied on superior gunnery to win him a victory, which was, however, given him by the incompetence of the Russians, and their failure to appreciate the fact that the only hope of future salvation for their country lay in their crippling the Japanese fleet, even if, in doing so, they themselves were annihilated. Anything would have been better than an ignominious return to their shell-swept port of departure.

We now turn to the second and bigger fight of this war, known as the Battle of Tsushima, or of the Sea of Japan, in which Togo showed himself a master of strategy and tactics, and manœurved his fleet in striking contrast to anything he had previously done.

It was this battle that settled the doom of the Baltic Fleet, which had arrived so close to its destination without being assailed during its voyage of many thousands of miles.

As regards the strategy preceding the battle, a glance at the map will show that in selecting Mesampho Bay in the Korean Straits, in which to await his enemy's approach, Togo had chosen a very advantageous position, and possessed what are known as interior lines. Vladivostok was bound to be the goal of the Russian fleet since the fall of Port Arthur, and, to get there, they had to enter the Sea of Japan, either by one of the channels between Japan and Korea, or by passing outside the island of Nippon to attempt the passage of the Tsugaru Strait, or the more round-about route through Perouse Strait. Had they decided on either of the two latter courses, Togo, warned by his cruisers, would have had plenty of time in which to convey his large fleet from his point of vantage to the threatened channel, without having to make use of his superior speed. A good strategical disposition, therefore, on interior lines, enabled him to make certain of meeting his foe without any great effort. Now, had the advantage of speed rested with the Russians to any considerable extent, Togo might have been compelled to take up a position in the Sea of Japan further to the northward, so as to avoid all chance of the enemy getting round outside the islands and through one of the northern Straits, before he could get up to meet them. A high speed would have been of great advantage to the Russians under these circumstances, for, had the preponderance been such as to compel Togo to desert the narrow part of the Strait for the more open sea to the northward, they would have had a better chance of getting to Vladivostok by the direct route, using their superior speed to avoid combat, which, now as before, was evidently their sole desire, and which, as pointed out then, is not a spirit conducive to winning victories. The objective of a battle fleet is the battle fleet of the enemy, and, if it is not strong enough or self-confident enough to meet it, it had far better have stayed at home.

There is no doubt that, if Port Arthur had fallen before the Baltic Squadron had sailed from Europe, it would never have made its disastrous journey. It would have been more instructive to the world at large if the heterogeneous collection of vessels composing

Rodjestvensky's Squadron had possessed an advantage in speed over the Japanese, and Togo had, in consequence, been set a harder problem. The Russian Admiral had made up his mind that he would have to fight, but hoped to reach Vladivostok after some losses on both sides. He, therefore, on leaving the Yangtze, did not attempt to avoid the enemy, and, on the morning of 27th May, 1905, was proceeding leisurely with his whole fleet at 10 knots, heading for the Eastern Korean Strait. The battle-ships were in two columns with the cruisers and torpedo craft on their flanks and rear. The day was foggy, and vision limited to a distance of four or five miles. At 10 a.m., when abreast of Ikishima, they first saw the enemy's cruisers on either hand, and a change in the disposition of the fleet was then made, which became as follows, course, north-east:—

In the right or starboard column were the four powerful battle-ships "Kniaz Suvaroff" (flying Admiral Rodjestvensky's flag), "Borodino," "Alexander III.," and "Orel." In the left or port column were the battle-ship "Oslabya," the two old battle-ships "Navarin" and "Sissoi Veliky," and the armoured cruiser "Admiral Nakhimoff," then the battle-ship "Imperator Nicolai I.," the three coastguards and four cruisers bringing up the rear. The auxiliaries and scouts were behind and between these two columns. The object of assuming this extraordinary formation is beyond comprehension, unless the original idea was to use the four fast modern battle-ships as a flying division with a roving commission, the remainder forming the main fighting line.

Togo, being apprised by wireless of the exact position and formation of the enemy, formed his first and third division (consisting of four battle-ships and eight armoured cruisers) into single line ahead, and steered a south-westerly course, so as to appear to have the intention to pass the Russian fleet on opposite courses, port hand to port hand, at extreme gun range; but, instead of doing this, he turned to the eastward by a nicely calculated turn and pressed obliquely on the head of the Russian left column. He turned his fleet at extreme gun range, so that the Russians could not take advantage of him on the turn when his position was tactically weak, the head of his column being exposed to the whole Russian broadside. Actual speed, regarded as a simple velocity and not relative speed, was obviously an advantage in this manœuvre, as the higher the speed the less the time that was given to the Russian admiral to counter it by turning away to the eastward himself, which he did not immediately do, as he was apparently engaged in getting into single line ahead by placing his starboard column at the head of the port column. The concentrated fire of the Japanese ships soon finished off the "Oslabya," which bore out of line to starboard.

By this time the Russians would seem to have got into some straggling form of line, and were heading to the eastward parallel to the Japanese line, the two fleets being between 4,000 and 5,000 yards apart. The superior speed of the Japanese ships caused them to draw ahead and so to turn in succession towards the Russians and threaten the head of their line. Rodjestvensky countered by turning away to the southward to avoid being enfiladed, so that both fleets were gradually turning on concentric circles. In this case, however, the Japanese had a marked tactical advantage as their compact line was opposed to the long and straggling Russian line, so that their broadsides were only immediately confronted by those of about half the

number of ships. In fact, the advantage corresponded to that obtained in the old days by "doubling the line," except that the Russians were only engaged on one side. At 3 p.m., after nearly an hour's firing, we find the two fleets heading to the S.E. The fate of the day was decided, the "Suvaroff," "Alexander III.," and "Oslabya" being *hors de combat* and out of the line, the remainder of the fleet, now led by the "Borodino," having no other object but flight. At this hour a fog bank obscured the field of action, and this, aided by the smoke, enabled the Russians to turn unperceived in succession to the northward, probably in the hope of picking up the three wounded battleships and supporting their admiral. Unfortunately for them the fog lifted in time to enable Togo to turn and save his rear from being threatened and again we find the two fleets on parallel lines, and the same manœuvre being repeated, the Russians being forced to the westward to avoid being enfiladed.

The remaining phases of the day's fight are of no special value for drawing conclusions as regards the merits of speed and armament in the modern battle-ship. The issue was decided in the first hour, after which the Russian fleet became more or less of a rabble, and *sauve qui peut* was the order of the day. Here a high speed was, however, an advantage to Togo's ships in enabling them to speedily overtake and capture or destroy the flying remnants of the Russian fleet on this and the following days.

The "Borodino," which for four hours' intermittent fighting bore the brunt of the attack, sank at 7 p.m. The "Orel" was captured the next day when Nebogatoff surrendered, so that of the five modern battle-ships the Russians lost four by sinking and one was captured. With the rest of the fleet we are not concerned.

To what causes are we, then, to ascribe the enormous difference between the result of this action and that of the 10th of August?

In the first place Togo's great advantage was due to a well conceived and executed tactical move, whereby he was enabled to concentrate his fire on the head of his enemy's weaker column, and sow in it the seeds of demoralisation whilst sheltered himself from the fire of their best ships. The reason for the tremendous difference in damage done to the ships was that Togo profited by his previous experience and decided to fight at a closer range, rightly trusting to his vigorous onslaught to be his best weapon of defence, and not to the inert armour plates which covered his sides. The Russians opened fire at about 8,000 yards, whilst the Japanese were turning, but the latter did not reply till the range was about 6,500 yards, and rapidly decreasing, so that a fair percentage of shots might be expected to hit.

The range during the critical period, that is to say between 2.30 and 3 p.m., was between 4,000 and 5,000 yards.

They found this a more profitable method of expending ammunition than that which they employed on the 10th of August, where a large portion of the contents of the magazines and shellrooms were expended on a no more responsive foe than the ocean. As regards the calibres of the guns engaged, the numbers of heavy guns were about equal on both sides, but the Japanese had many more 6-inch guns, and it was undoubtedly to these weapons that the victory was principally due. At the former battle there were no fires of any consequence—now all the Russian ships on which fire was concentrated burst into flames. The reason for this is to be found in the difference

in the rate of hitting on the two occasions. On the 10th August hits were few and far between, and incipient fires could be extinguished; at Tsushima the shell were falling like hail, and the disorganised *personnel* could not cope with the flames.

The actual cause of the sinking of the four battle-ships seems to have been their overloaded condition, which caused the tops of the armour belts to be only just above the water-line. Water was thus allowed to enter through holes in the side above the belt, and, once having entered, it made rapid headway. This is only a conjecture, formed from the condition of the "Orel" on her arrival in Japan, when, though badly damaged and presenting a lamentable appearance, she had no holes through her side armour, but was very deep in the water, owing to a heavy deck cargo of coal.

The water, being confined to the water-tight compartments on the engaged side of the ships and causing them to list heavily, was obviously the reason for their turning turtle on sinking. It is uncertain whether the immunity which the side-armour enjoyed was due to the inability of the Japanese shell to pierce on account of an over-sensitive fuze, or to the poor shooting from the heavy guns in the lumpy sea which prevailed, and the narrow portion of the belt showing above water. It is very probable, however, that the shooting from the heavy guns was poor, seeing what their capabilities are in fine weather and under the most favourable conditions. The Japanese losses were no more than on the 10th of August, the "Mikasa's" less than on the former occasion. This shows how effectually their own fire, aided by the bad gunnery of the Russians, protected them from injury.

The Russians did not lack bravery, but their discipline, moral tone and general efficiency were greatly inferior to those prevailing in the Japanese fleet; the formation of their fleet, and their neglect to throw out scouts was, of course, inexcusable. They laboured under a great disadvantage, in that they were receiving their baptism of fire at the hands of seasoned veterans, confident in their own powers of gaining the victory.

The following is a brief summary of the principal conclusions concerning speed and armament which may be drawn from our study of these two battles:—

1. A high speed is of advantage in assuming a sound strategical position for a fight, in forcing an unwilling enemy to fight, and in preventing him from escaping at the end of the battle and thus robbing you of the complete fruits of victory. If, on the other hand, he compasses your defeat, you can make use of your speed to preserve you for another day. A fleet can largely counter-balance an inferiority in speed by working on interior lines and by good scouting.

2. A high speed is of advantage in executing quickly a tactical move, and not giving the enemy long in which to make up his mind. A high relative speed is of advantage in regulating the distance at which an action is fought, provided this advantage is pursued in the right direction, that is to say in keeping the range short and not long. An advantage in speed does not, however, ensure any practical gain in the tactical distribution of fire. It was the bad station and general disorganisation of the Russians which gave the Japanese their superiority in distribution of fire at Tsushima.

3. A large volume of rapid and well-directed fire is necessary to demoralise the enemy and prevent him from replying with steadiness

and accuracy. This necessitates a gun laid and loaded by hand; at the same time a large calibre gun, firing a shell capable of carrying its bursting charge through thick armour, is necessary to penetrate to the enemy's vital parts, while the light gun fire prevents him from successfully replying.

4. To ensure a sufficiently rapid rate of hitting, the action must be fought at a decisive range, that is to say within 6,000 yards. Long range actions will principally advantage the manufacturers of ammunition.

## PART IV.

In this part of the subject we are going to take a look at the actual weights involved in the construction of a modern battle-ship, with a view to seeing what we may expect in the ideal ship. It does not purport to be a lesson in ship construction, which is a subject better left to those who make a lifelong study of it. It is only desired to give the amateur some rough idea of the considerations involved.

The designing of a war-ship would be an almost impossible task were it not for the experience and *data* gained from previous ships.

The total displacement of a completed design is made up of the following items:—

I. *General Equipment.*

This comprises water, provisions, officers' stores, crew and effects, masts, rigging, etc., anchors, cables, warrant officers' stores and net defence.

II. *Armament.*

This includes the weight of guns, shields, gun mountings, ammunition, torpedoes and torpedo-tubes.

III. *Machinery and Engineer's Stores.*

IV. *Coal.*

It is the practice to include a certain weight of coal in the designed displacement of war-ships. This weight is called the legend weight, and is roughly about one-half of the full sea-going stowage. All official steam trials for speed are carried out at the draught corresponding to this legend condition.

V. *Armour and Protection.*

This consists of:—

*a.* Weight of vertical armour (exclusive of that on barbettes or turrets, casemates, protective plating, conning tower, and ammunition tubes).
*b.* Weight of protective plating on sides.
*c.* Weight of protective deck plating, including armoured shutters and gratings.
*d.* Weight of backing, exclusive of that on barbettes or turrets.
*e.* Weight of barbettes or turrets, with their armour and backing.
*f.* Weight of casemates complete.
*g.* Weight of conning tower and communication tube.
*h.* Weight of ammunition tubes complete.

VI. *Weight of Hull.*

This comprises:—

*a.* Weight of hull proper, including framing of barbettes or turrets, etc.

*b.* Weight of sheathing.

*c.* Weight of ballast.

VII. *Board Margin.*

This is a margin allowed to cover alterations or additions to the design made during the progress of building.

These details have been mentioned to show the manifold considerations which embarrass the war-ship designer; we have only to deal with those constituents mentioned under headings II. and III., and, in a lesser degree, those under IV. and V., and can therefore start by considering the other factors as of a constant value.

It must be clearly understood, however, that all these constituents are largely interdependent. At the outset the dimensions, form and displacement, are undetermined, yet upon them depend the power which the engines must develop to give the desired speed, the weight of the hull and the weight of certain parts of the equipment. It should also be borne in mind that weight saved in any of the features of the design has a far greater influence on the design than the actual weight thus saved. For instance, suppose it is decided to carry fewer rounds of ammunition per 6-inch gun, so as to decrease the weight by a hundred tons. The ship thus lightened requires less horse power to give her the designed speed, and, therefore, smaller engines, and less men to work them. A smaller ship will then be sufficient, which will weigh less than the ship as originally designed, and require less horse-power. Thus these factors act and re-act on one another until we find that, by saving a hundred tons on ammunition, we have probably saved two hundred or three hundred tons on the whole design.

The following is a table of the legend weights for three recent types of British battle-ship, from which we can draw several valuable conclusions.

Table of legend weights (percentages) of whole of items shown under the various headings:—

| — | I. | II. | III. | IV. | V. | VI. | VII. |
|---|---|---|---|---|---|---|---|
| Formidable... ... | 5·2 | 11·6 | 10·2 | 6·2 | 29·0 | 37·5 | 0·3 |
| King Edward VII. | 4·2 | 15·7 | 11·3 | 5·8 | 25·5 | 36·0 | 1·5 |
| Dreadnought ... | 5·0 | 19·0 | 16·7 | 5·6 | 20·6 | 33·1 | — |

The figures of the "Dreadnought" are only approximate.

Sir W White, in his Manual of Naval Architecture, gives the weight of hull in a modern battle-ship and cruiser as 38 per cent. of the total weight of the ship complete; but it will be seen by inspection of the above table that the percentage of the displacement taken up by the hull has been capable of reduction, partly owing to the increase in the size of ships, which naturally decreases the percentage of the weight of hull (except in the case of a vessel of light scantling,

such as a destroyer), and partly to improvement in material and construction. He, however, points out in his recently delivered Cantor lectures that the limit of reduction in scantling is not yet reached, but that it will be determined eventually by considerations of durability and provision against local straining or corrosion, and, as a consequence, the economy of structural weight does not follow strictly the increase in strength of the material used.

The tonnage, main armament (total and available on the broadside), full speed and approximate cost when finished of the three above-mentioned types of ships are as follows:—

| —— | Tonnage. | Speed. | Main Armament. | Broadside. | Cost. |
|---|---|---|---|---|---|
| Formidable ... ... | 15,000 | 18 | Four 12-inch<br>Twelve 6-inch | Four 12-inch<br>Six 6-inch | £<br>1,100,000 |
| King Edward VII. | 16,350 | 19 | Four 12-inch<br>Four 9·2-inch<br>Ten 6-inch | Four 12-inch<br>Two 9·2-inch<br>Five 6-inch | 1,500,000 |
| Dreadnought ... | 18,000 | 22 | Ten 12-inch | Eight 12-inch | 1,800,000 |

It will be seen that the initial cost of two "Dreadnoughts" is about the same as that of three "Formidables."

Now, from the table of legend weights we can see the percentages of the displacement allotted to the armaments in the three types of ship, and can, therefore, get the actual weights taken up by these armaments, which are as follows:—

| —— | 12-inch. | 9·2-inch. | 6-inch. | Torpedo tubes. | Total Tonnage. |
|---|---|---|---|---|---|
| Formidable ... .. ... | 4 | — | 12 | 4 | 1,740 |
| King Edward VII. ... ... | 4 | 4 | 10 | 4 | 2,570 |
| Dreadnought ... ... ... | 10 | – | — | 5 | 3,420 |

That is to say that the "King Edward VII.," for about 50 per cent. more tonnage than the "Formidable," carries four more 9·2-inch guns and two less 6-inch guns, whilst the "Dreadnought," for about double the tonnage of the "Formidable," carries six more 12-inch guns, and 12 less 6-inch guns (*i.e.*, none at all).

It will also be noted that the tendency has been to steadily increase the percentage of the displacement given up to the armament.

As regards the torpedo armament, the percentage of the displacement given up to it is very small, but a large amount of valuable space is occupied by the submerged flats, which, as pointed out before, would be better employed in holding additional ammunition for the heavy guns.

Turning to the ideal ship, which is to carry 12-inch guns and 6-inch guns in the proportion of 1 to 2, and whose torpedo armament is to consist of two torpedo tubes in one flat, it will be seen by a careful inspection of the above tables that if the ship carries eight

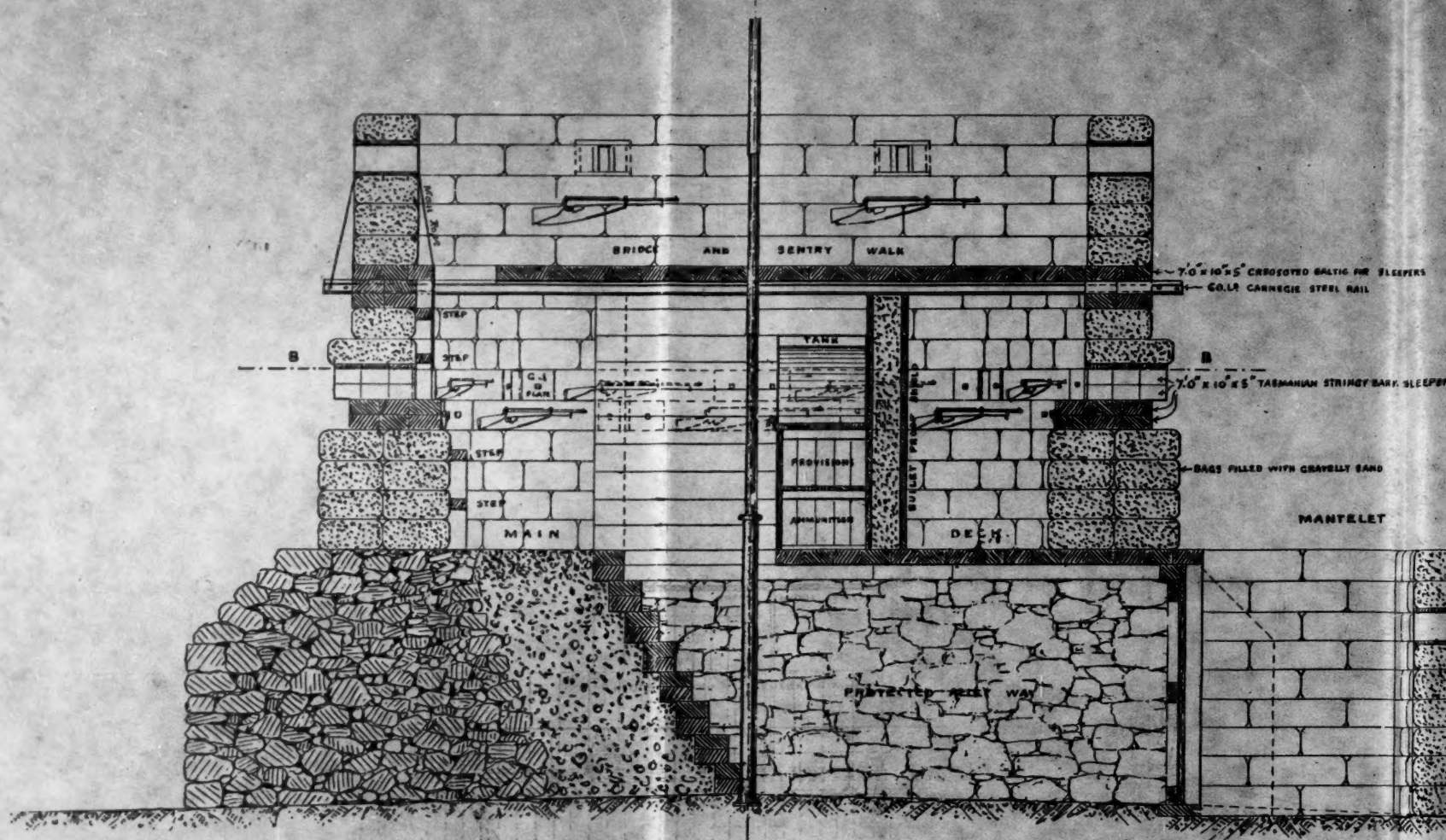
12-inch and sixteen 6-inch guns, and is to have a speed of 19 knots, she will have to be about 18,000 tons, and will require about 3,500 tons to carry these guns and two torpedo tubes, allowing for a largely increased supply of ammunition, viz., about 150 rounds per gun for the 12-inch instead of 80, and 400 rounds for the 6-inch instead of 200. This seems to be as large a number of guns as can be conveniently placed in one ship without unduly increasing her size.

It is proposed that the 12-inch guns should be mounted in pairs with a high command; one pair to be mounted at each end of the ship on the middle line, and one pair amidships on each broadside. The end pairs of guns to have an arc of fire of 270 degrees (*i.e.*, from right ahead or astern to 45 degrees beyond the beam on either side), and the broadside pairs of guns to have an arc of training of 120 degrees (*i.e.*, 60 degrees on either side of the beam).

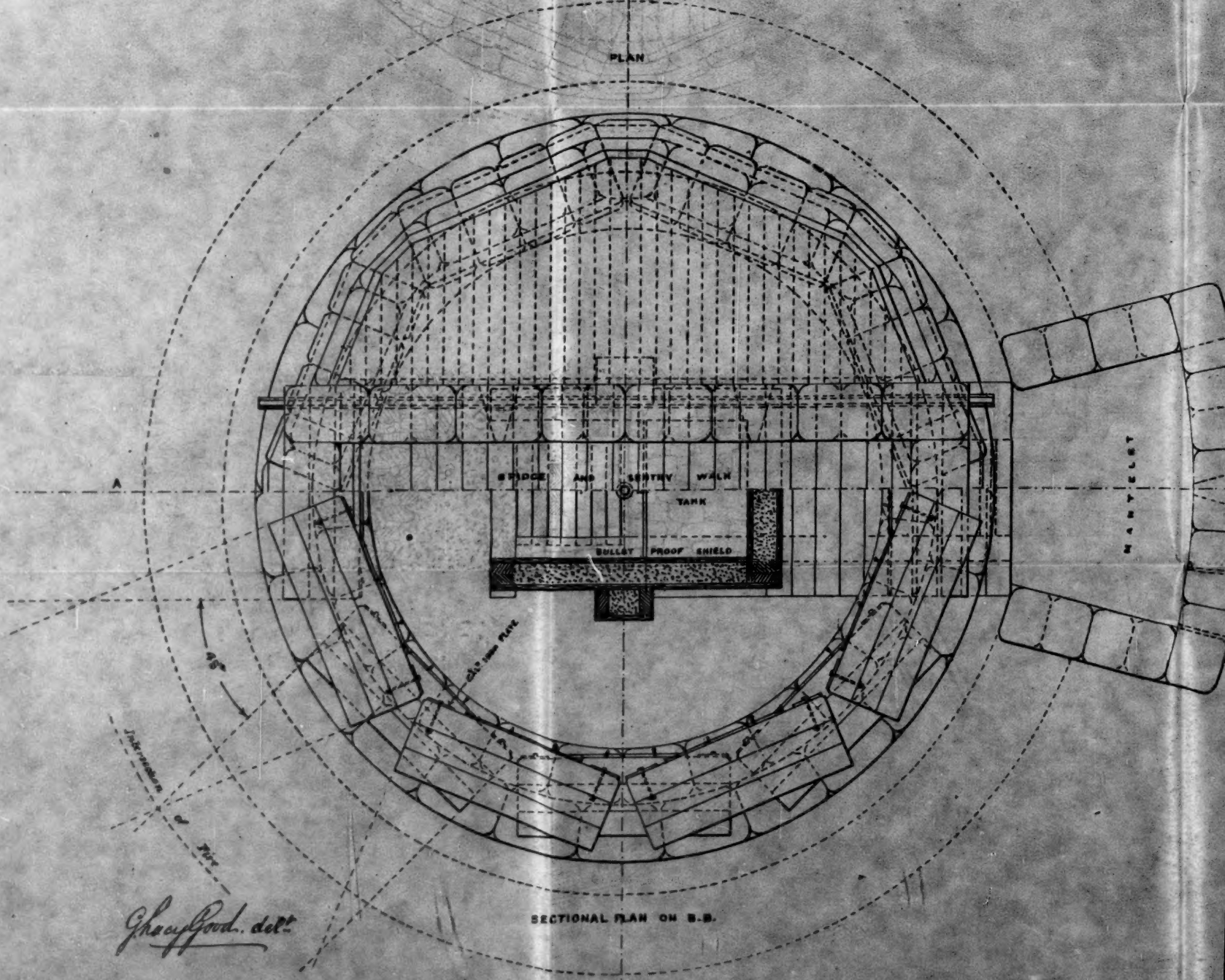
The 6-inch guns to be mounted in double casemates in two tiers, similar to those mounted in the "King Alfred" type of British cruiser, the end guns having an arc of training of 135 degrees (*i.e.*, from right ahead or astern to 45 degrees beyond the beam), and the eight midship guns an arc of training of 120 degrees (*i.e.*, 60 degrees on either side of the beam). Two pairs of double casemates to be fitted on either side of the midship 12-inch turrets. The floors of the casemates are not to coincide with the upper and main decks, as is the present custom, but are to be raised about four feet above these decks, so as to give the guns a higher command, and to enable the lower tier of guns to be fought in moderate weather, an impossibility with the main deck guns of many classes of ships now afloat. In really heavy weather the upper deck guns would be the only ones of any use, and, as I previously pointed out, power-worked guns are of little good in a seaway. The ideal ship would have to be a few feet longer than the "Dreadnought," to give sufficient spacing between the guns. She would have in the broadside six 12-inch and eight 6-inch guns to oppose to the eight 12-inch of a "Dreadnought," and she ought to stand a better chance than the latter in an artillery duel. No amount of target practice can prove this contention; until the target commences to shoot back at us, we shall not know how we stand. In the meantime, we have only got the results of the recent war to help us, and they all go to prove that the incessant rain of smaller projectiles will go far towards preventing a ship armed only with heavy power-worked guns from suitably replying, and will, at any rate, disconcert its more deliberate fire.

In right ahead or right astern fire the ideal ship has only two 12-inch and four 6-inch guns to oppose to the six 12-inch guns of a "Dreadnought," but, as pointed out before, end-on fire in a battle-ship is not considered to be of such paramount importance as to justify the sacrifice of guns on the broadside, which is the tendency in the "Dreadnought." In the latter, in order to clear the way so as to allow the broadside 12-inch guns to fire in line with the keel, the broadside has to be kept clear of all other ordnance. If it were possible to mount more guns, the blast would be prohibitive when firing near the ends of the ship. In a cruiser end-on fire is of paramount importance, and, if necessary, the broadside fire should be sacrificed to it; the reason being that a cruiser is more likely to fight her actions when chasing and being chased than is the battle-ship, whose object is to meet and defeat her counterpart in the enemy's fleet.

GROSS SECTION




PLAN



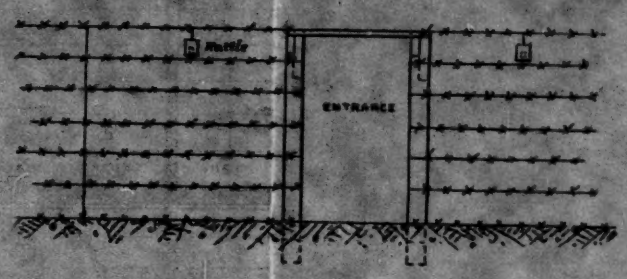

SECTIONAL PLAN ON B-B.

*Geo. Good. del.*

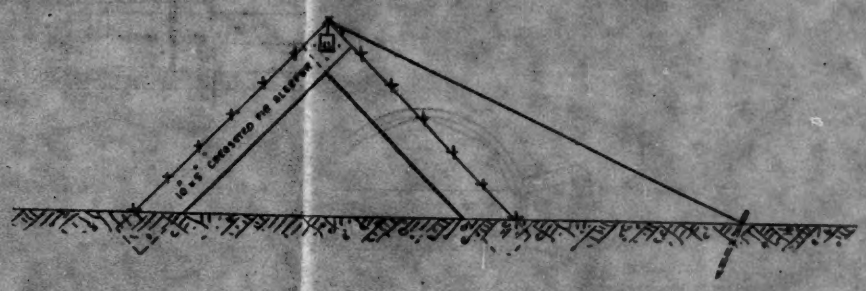
*J. J. K. & Co., Limited, London.*

## WIRE ENTANGLEMENT

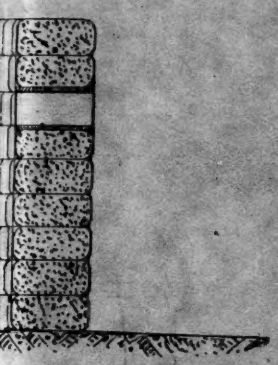
ELEVATION

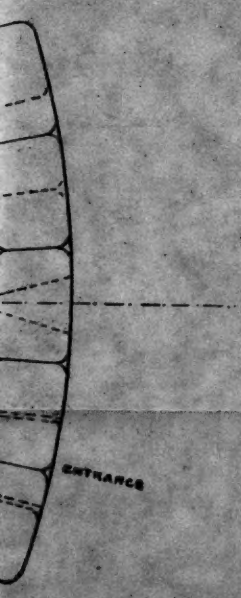



SECTION

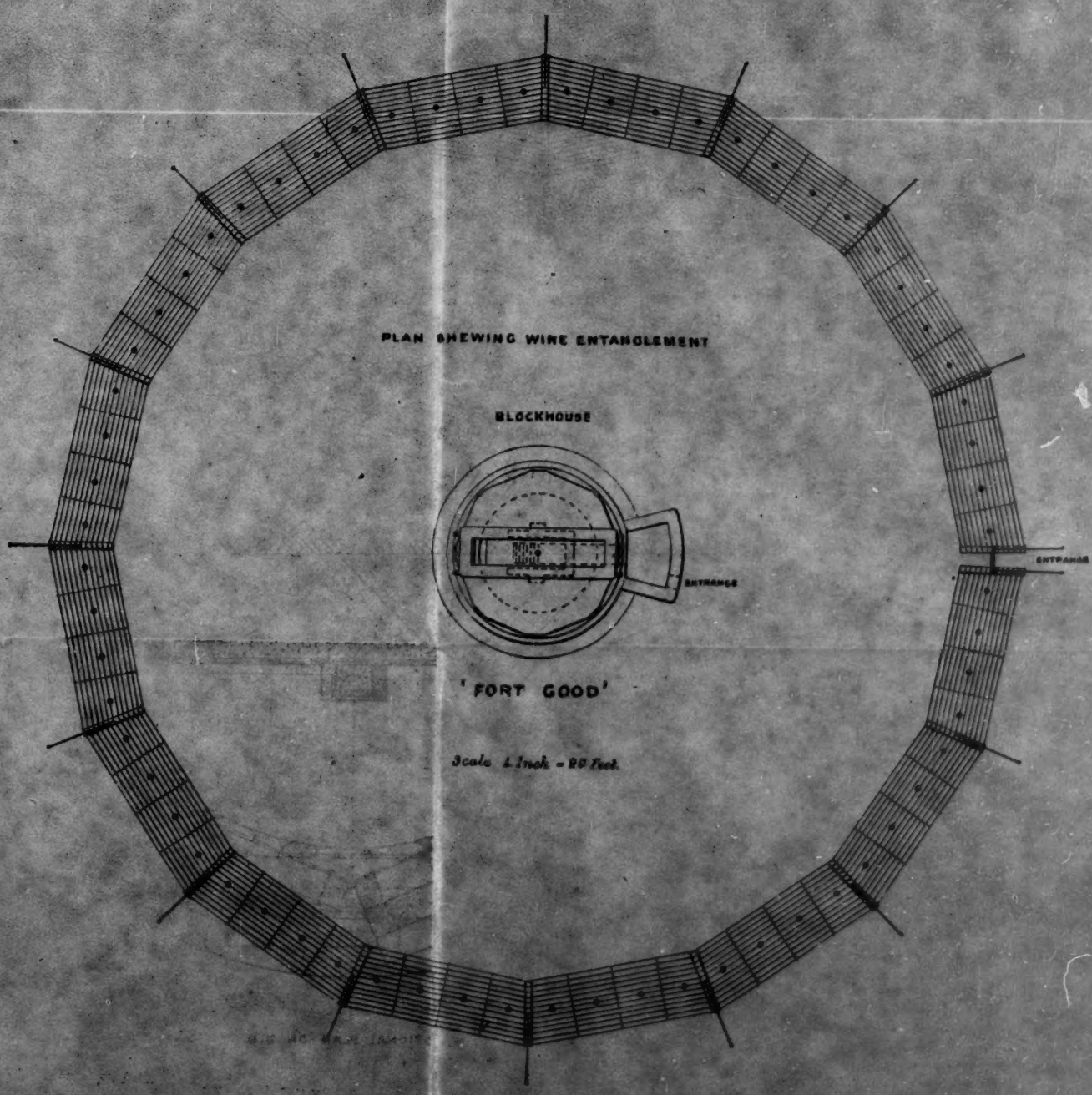



Scale ¼ Inch = 1 Foot.






PLAN SHEWING WIRE ENTANGLEMENT




'FORT GOOD'

Scale 1 Inch = 20 Feet.

To get some idea of the legend of weights for the ideal ship, we will begin by putting down the percentages of the displacement allotted to factors outside the scope of this essay. Thus, allowing 5 per cent. for general equipment, 34 per cent. for weight of hull, and 6 per cent. for legend weight of coal, we are left with 55 per cent. of the displacement to allot to the provision of speed, armament, and protection. We have seen that the armament will require about 3,500 tons or 19·5 per cent. The protection will absorb about 22 per cent. of the remaining displacement, if it is on similar lines to that given to the "Dreadnought," with 6-inch armour on the case-mates; this broadside armour would render the ideal ship one of the most powerful protected vessels afloat.

We have now got 13·5 per cent. of the displacement left to allot to machinery and engineer's stores. This should be sufficient to give an 18,000-ton ship a speed of 19 knots, with turbine propulsion.

The legend of weights for the "Dreadnought" and the ideal ship will, then, compare as follows, using the same headings as in the previous table:—

| —— | I. | II. | III. | IV. | V. | VI. | VII. |
|---|---|---|---|---|---|---|---|
| Ideal ship ... ... | 5·0 | 19·5 | 13·5 | 6·0 | 22·0 | 34·0 | — |
| Dreadnought ... | 5·0 | 19·0 | 16·7 | 5·6 | 20·6 | 33·1 | — |

The cost of both types of ship would be about the same.

This, then, is the solution of the problem which we set out to solve.

Give the ship as great an offensive power as possible on the tonnage to which you wish to limit her size; give this armament and the ship in general an adequate protection, depending on the degree of efficiency of the ordnance of the day, give her fuel to carry her 8,000 miles at economical speed, and a full speed of 19 knots.

Armament is the first consideration in a battle-ship, to which everything else must give way. If necessary, the inert defence, the armour, must be pared so as to allow the weapon of defence, the gun, to be conveyed at a sufficiently high velocity from place to place.

Speed is a very desirable attribute in a battle-ship, both strategically and, to a lesser extent, tactically, if applied in a proper manner, but it is not going to decide battles nowadays any more than it did in the days of the sailing-ship. These are going to be won, as heretofore, by the gun, and by the skill with which it is controlled.

# THE ORGANISATION OF POWER TRACTION ON ROADS FOR NATIONAL DEFENCE.

*By Colonel Right Hon. Sir J. H. A. MACDONALD, K.C.B., (Hon. Colonel, Army Motor Reserve).*

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Monday, 11th February, 1907, at 3 p.m.

Colonel Sir REGINALD HENNELL, D.S.O. (Lieutenant of the Yeomen of the Guard), in the Chair,
in the absence of Lord MONTAGU OF BEAULIEU.

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TWO months ago the Secretary of State for War, speaking in public, said:—

> "I am an optimist as to what the people of this country would be willing to do for their country in a national emergency."

These words, all will agree, are such as would be uttered by every good citizen. The willingness is an unquestionable national asset. There are few men in this land who would not make any sacrifice of person or purse if a direct attack was made upon the country. Still, they are only words—no doubt well meant words—but which will delude and snare the ignorant if they are believed to be spoken from the mouthpiece of a War Office, which is efficient as an organisation, and has provided already the quota of trained men and up-to-date *matériel* of war to give the national patriotism a common-sense expression in fact. Is there anyone inside or outside of the War Office who finds himself for a moment prepared to believe that if an attack upon our shores was imminent, Mr. Haldane's Department would be ready—ready in men, in arms, in ammunition, in transport, and in organisation—for movement, either by rail or road, to meet an enemy? If anyone were to tell us that all was right we should be inclined to accept his *archi-prèt* assurance in the light of the events of 1870, when a glowing report was given to the unfortunate Emperor of the French, encouraging him to plunge into war on the footing that all was perfect to the last cavalry buckle.

We never have been, and we are not now, ready to meet invasion in the event of a successful landing. Mr. Haldane himself said only six weeks ago of our Regular Army: "It was not in a state which rendered it fit to encounter a great war." And he is still engaged

in deep thinking as to what is to be made out of the Auxiliary Forces. On the other hand, the British public is but too willing to be lulled to sleep by Blue-Water assurances, and to find in the theory of the impossibility of invasion an excuse for starving the land Services, and neglecting the organisation necessary to make effective use of such means of defence as are available. I hope that it will be understood that I am not to discuss any question between the Blue-Water School and those who hold that our insular position forms no excuse for having our home defences in the inefficient condition in which they are. The position I take up on that matter is this: That as long as the Government of this country professes to provide for home defence on land, the profession should be carried out efficiently. That it has never been done yet we all know; but there has always been a recognition of a duty to be prepared. And I say emphatically that while our condition is one of technical unpreparedness, such words as Mr. Haldane's, about what the people of this country would do in a national emergency, are as the blatant blaring of sounding brass—a make-believe which will not reassure sensible men at home, or excite anything but a contemptuous laugh abroad. The secret services of foreign Powers are too thorough in their work for "prave 'orts" such as these platform utterances to deceive the General Staff of any Continental Power.

If we are fostering in ourselves the delusion that our condition as regards trained men, *matériel* of war, and transport is not practically known in the War Departments of our Continental neighbours—that our unreadiness is not accurately gauged—then we are dwelling in a fool's paradise, and the sooner we come out of that comfortable region of complacency into the cold but bracing region of fact, the better it will be for us.

In the meantime, as my desire is to show how the forces and *matériel* we have in fact, can be brought to any point of decision with dispatch and in good fettle, I shall make the assumption that the War Minister has done his duty in providing forces sufficient in number and training, and that the Executive of the Army has had provided for it the proper equipment in arms, ammunition, and other munitions of war, and has a sufficient and instructed staff to draw upon to issue the necessary detail orders, and to see them promptly carried out. Of course, I do not know what are the elaborate and complete paper schemes which have been thought out and portfolioed in the great national defence building next door. If the schemes are not complete, and the means for carrying them out do not exist, then that gorgeous building represents but a new cup and platter with polished splendour outside, while there is rottenness, as of dead men's bones, within. Perhaps the day will come when the War Minister will no longer be a sort of humble Oliver Twist, asking vainly for more, and that the Chancellor of the Exchequer, who I believe is the only Cabinet Minister whose official dress in style and grandeur resembles that of Bumble, will no longer hold up his hands in unctuous horror at the depravity which asks for more than parochial allowance, served out from the financial buttery on the other side of the street, to the hunger-pinched Oliver of the War Office.

But making the assumption that all is ready is only for the purpose of testing whether what I have to propose would be suitable for the moving of the necessary troops and their supplies, with a

rapidity and efficiency not to be attained in any other way. And here let me say, that I may not be met in any of my hearers' minds by the thought that as we have not in fact the troops, or at least have not sufficient Regular troops, and that the other forces are not in a sufficient degree of efficiency, that therefore it will be time enough to consider problems of transportation when these deficiencies are remedied. It is a conclusive answer to any such comment, mental or expressed, to say that if the Regulars are too few, it is the more important to be able to carry every man of them, from wherever he may be to the point of decision, with the utmost possible speed, and that as regards the other forces, it will be necessary to bring them also rapidly forward, to do the best with them that can be done. I presume that no one will suggest that if a raid was being attempted we should at once sue for peace, because we thought our forces insufficient or deficient. The Ministry that did so would certainly be impeached and earn the scorn of every good citizen. Except a few peace-at-any-price fanatics, every man, aye, and every woman, would insist that defeat should only be accepted when national honour had been saved by a determined resistance, up to the point of our being faced with exhaustion of our resources.

Now, the question that I ask my audience to consider to-day is, what is the best means we have at our command for movement of defensive troops in case of threatened invasion? To answer that question it is necessary first to consider what must be the aim and intention of our military rulers in conducting proceedings against an expedition by sea attempting to invade these islands. Must it not be to prevent his effecting a landing? For this purpose the thing to be desired is that we shall be able to concentrate rapidly a fire force at the place where a landing is to be attempted—such a fire force of great and small arms as shall make an effectual landing impossible. And that we may have this, the things essential are:—

1. An accurately ascertained detail of those parts of our coast which are vulnerable from the shore, being such that a landing is feasible.
2. An accurate mapping out of the country, showing the routes available from one part to another in all directions.
3. Arrangements matured for the orderly and efficient conveyance of the troops with all possible dispatch.
4 Arrangements for a full supply of ammunition for a dogged fire resistance, for it is by superiority of fire alone that at the point of decision we can hope for success.
5. Means available at all points where there are troops assembled on the coast to move them rapidly from one point to another over considerable distances, with a full supply of ammunition.

Our purpose and determination must be first, to give the enemy no opportunity for manœuvring against us on land; and second, to meet him in force at every point at which he may attempt to occupy the shore. We must be ready to conduct the contest in the most favourable manner for ourselves, viz., by causing a maximum of loss by fire while the enemy is most exposed and in the least favourable position to return the fire with effect—that is, while he is still upon the water and cannot entrench himself or effect any secret flanking

movement, or thin out his attack, so as to minimise loss, but must come on direct, presenting his launches and his boats as well-defined targets to great arm fire for miles, and to great and small arm fire for the last mile and a half, and under every disadvantage as regards effectiveness of his own rifle fire, from his troops being crowded into bulky units, which cannot approach the shore for a simultaneous landing, unless all vessels conveying the troops conform to the speed of the slowest. There is another point of great consequence in the use of an overwhelming fire in such a case, and that is that there are very few parts of a coast where if a landing is not effected within a very few hours of the commencement of the attempt, the change made by the tide will not materially assist the defence to thwart the enemy's intention for the time being; and hours may be as important as days would be at another time. The essence of the defence, therefore, is predominance and persistency of fire at once when range admits, and its intensity never slackening, making the zone of fire impossible to be crossed. Be it remembered, also, that the ascertainment of range is much in favour of the troops which are firing over water. The enemy approaching the shore, if he uses his small arms to aid in keeping down the fire of the defences cannot tell whether his bullets are taking effect or not; but those firing from the shore can see at once where their shots are falling in the water, and the fire can be regulated accordingly. Even at night, with efficient search-lights, such regulation would not be difficult, while the search-lights of the ships of the attacking fleet could reveal nothing of the defensive dispositions, and if used must assist the defence by throwing diffused light over the water which their shore-seeking boats are passing over.

Now, if this be what we must aim at in our arrangements, the first question is whether the means which we have had at our hand for many years for rapid and effective concentration are not sufficient and the best. It is true that we possess a large network of railways, and many would naturally say that transit by rail must be more speedy than transit by road. War Office officials may suggest that we have a duly appointed Railway Service Corps which could be depended upon to do all that was needful. It is part of my purpose to convince those who so think that such a view is erroneous.

Paradoxical as it may appear to make the assertion that a railroad is not in present circumstances the best means for rapid movement on a large scale, when emergency calls for swift concentration of men and *matériel* for national defence in a country like Great Britain, it is nevertheless a true assertion. Our ideas of rapidity in travelling naturally centre on railways as the embodiment of speed; but whenever it has become possible to travel by road at a speed such as is attained by the ordinary power vehicle of to-day, the railroad for military purposes must take second place, and that for the following reasons:—

1. The conduct of traffic by rail involves an elaborate adjustment for the ordinary traffic. The moment that adjustment is seriously disturbed, the readjustment is necessarily a work of difficulty, and cannot be done or brought into smooth working at a day's notice.

2. The gathering of rolling stock and haulage engines to the places where the suddenly arising emergency makes them necessary, and the marshalling of the rolling stock into the needful detail, must absorb much valuable time, and can only be done by a skilled and practised railway staff accustomed to act together, which could not be

the case except on the main through lines, while it is highly probable that the lines crossing the country from one company s system to another might be the most important.

3. The whole proceedings for rail transit must be carried out by concentrating large units, which must be brought to a rendezvous and entrained in bulk. There is no possibility of picking up small units here and there, and pushing them forward to join their corps at the place near the front where the larger unit is to act, or camp, or be billeted. The smaller units, companies and sections of landward Volunteers must be drawn together before any practical movement by rail can be made.

4. The whole ordinary running of trains on the line must be stopped altogether, or must act as a constant obstruction to the forwarding of the military trains.

5. As the railroad does not admit of fast traffic passing slow traffic except at intervals of several miles, there would be much delay and often serious congestion, and the presence on the line of traffic which it was not of importance to forward quickly, might nevertheless block traffic, the speedy forwarding of which might be of vital consequence.

6. As the traffic is confined to rails, an accident (even slight) may block the line for hours, when every minute may be precious; and it is certain that accidents are most likely to occur when an established time table is suddenly thrown over and many trains crowded on to the line, officials over-worked, and drivers compelled to run on parts of the railway line which are novel to them and for (it may be) long hours.

7. The place where troops are most wanted may be a day's march or more from the station at which they must detrain.

8. All transit of *matériel* by rail involves the delay caused by three loadings and three unloadings between wagons and trains, the latter probably conducted in many cases under great difficulty from deficiency of available loading banks.

9. Much delay caused by the difficulty of providing sufficient road transport to carry *matériel* from the arrival place of the train to the place where it is required, and by the slow movement of such transport.

10. Probable confusion from the numerous transfers between road and rail vehicles.

On these and other grounds, which there is not time to discuss, I do not hesitate to say that with the means for transit which we now possess it would be easier, quicker, and more convenient in the case of it being necessary to move troops and their munitions and *matériel* of war during the first days of, or resistance to, invasion, to employ road power vehicles for the service of conveying the infantry, with all requisites for its efficiency and maintenance, and that over any distance not exceeding 150 to 200 miles, leaving the railroad free for cavalry, artillery, and bulk *matériel*, and also for ordinary traffic, so as to interrupt business as little as possible.

My main proposition is that there has been presented to us by the development of the motor road vehicle during the ten years that have elapsed since power traction was allowed practical scope for development, means for giving efficiency to national defence on land, such as we never possessed before, means which, if organised during peace for application in time of war, will give increased value to every power on

land that we possess, and that to a degree so great that it can scarcely be overestimated. There can be no doubt that in the case of an invading force endeavouring to effect a landing, speed in sending forward forces to oppose it, both as regards journey speed and ease of bringing the troops to selected places for defence, might make a small force more effective than a much larger number if the time necessary for bringing the latter forward was greater. Now, at the present moment, we have more than 120,000 vehicles on the road moved by mechanical power, and to add to these there are many thousands more standing ready for delivery, and many thousands more in the hands of second-hand dealers, a large proportion of which are quite efficient. It may give you an idea of the progress that is being made if I mention that in this country we are turning out about 500 new vehicles every week, while our imports from abroad are colossal, amounting during the past year to a value of £4,371,000 sterling. All these vehicles are capable of covering 150 miles in a day, and many thousands of them could do 250 miles within 12 to 15 hours. They will also be—to the number of 80 per cent. at least—as able to do a second day and a third day's work as they were on the first, and still be ready for more. It will illustrate to my non-motoring hearers what the road vehicle can do if, at the risk of appearing egotistical, I give them an illustration from my own recent experience. A few months ago I had to drive a car weighing a ton and a half from Coventry to Edinburgh, a distance of 326 miles, and circumstances made it necessary that I should be only two days on the journey. My son and I —driving alternately—reached Carlisle in time for dinner on the first day, driving through the busy streets of Warrington, Wigan, and Preston, and the narrow streets of Lancaster and Kendal, and lastly in the dark over Shap summit and through Penrith, covering in all 223 miles. On the second day we arrived in Edinburgh—103 miles—before two o'clock in the afternoon. It must be plain to everyone that in a country so well intersected by good roads such vehicles could, on emergency, do by the free and open road what it would be impossible to accomplish by rail.

Now, as regards national defence, the great point in favour of the road is, that the country being narrow, any defensive forces which might be available in central parts of the area could—given a good preparatory organisation, be moved, by a great number of roads, to any point or points on the coast to east or west or up or down on very short notice. For example, forces in Sunderland, Darlington, Manchester, Bolton, Bradford, Leeds, York, Huddersfield, Sheffield, etc., and in all the country surrounding these centres could be transported in one day's running from most of them, and in two day's running from the others, to the Yorkshire, Lincoln, or Norfolk coast, or northwards to the Northumberland or South-East Scotland coast, or to Liverpool, Barrow, or Southport, while in the same way the forces of these western places and of Liverpool, Preston, Wigan, Warrington, Birmingham, Cardiff, and Bristol, etc., could be taken eastwards with equal facility. The south could be reached from London and Bristol, and even from Birmingham, Wolverhampton, etc., in one day. These are illustrations merely. I state with confidence that many thousands could be dispatched by road from any district in any direction, and be half way to their destination before they could be concentrated at special centres in railway stations, the necessary rolling stock and haulage power organised and brought into position, the forces en-

trained, and the adjustment of traffic made to enable the requisitioned trains to use the line with anything like real dispatch. To take one or two central places as illustrations. A force in Birmingham could reach London, Portsmouth, or Plymouth, Hull or Harwich, Liverpool or Southport, or forces in Manchester or Preston could be moved to Carlisle, Newcastle, or Sunderland, and up to Edinburgh or Glasgow in one day, and it may be questioned whether this could be done on short notice by any of the railroads, particularly where the route was across country and running over lines owned by two or three different railway companies, such as in the case of an attempt to carry troops across from, say, Cardiff, Wolverhampton, or Birmingham to Hull or Harwich or Colchester.

As regards speed, every motorist knows that except in the case of express trains, it is as quick and often quicker to start direct from one's door, drive 50 or 60 miles, and arrive at the place at which our journey really ends, than to drive to a station, await the starting of a train there, and be turned out of the train some distance short, or it may be beyond, the place which forms the real goal of the journey.

It may illustrate what I mean more closely to refer to a place which has become classical in connection with invasion problems, the town of Dorking. It is, as you know, on the South-Eastern and Chatham line. An ordinary train travelling between London and Dorking is entered in the time tables as taking an hour and twenty minutes to make the journey. I shall assume, and the assumption is a large one, judging by my own experience, that the time is kept. To that time has to be added at both ends time for reaching the station, waiting till the train starts, and time for detraining and going to the place which you desire to reach, which of course is not the railway station. In that way the actual journey will occupy at least an hour and a half, allowing only five minutes for reaching the station and entraining, and five minutes for detraining and getting to the true destination. Now, that journey from point to point could easily be done by motor vehicles, driven with care and consideration, in an hour and a quarter, and they could return light to London at once in an hour and five minutes and bring another load, and could repeat this time after time through a long emergency day of, say, 16 hours, doing six trips without difficulty. Even a motor omnibus, running only at an average of 12 miles an hour, would accomplish the distance in two hours and ten minutes, and could certainly make three journeys up and down in a day of 16 hours. We have now nearly a thousand such omnibuses in London, and we shall at least have two thousand by the end of the present year. Assume that only 1,500 could be made available, and putting the load at the modest figure of 30 men, these 1,500 vehicles could in six journeys convey 275,000 men over any similar distance in 30 hours. This is a fair and unimpeachable illustration of the vast resource we now possess for rapid road movement on emergency. Double the distance, and the journeys must be halved; but even that would mean the movement of 137,500 men for 52 miles in one day, the proportion of men being in proportion to the mileage to be run. Nearly 45,000 men could be conveyed 180 miles if necessary in one day by the 1,500 omnibuses.[1] Of course, forces conveyed

[1] This, of course, does not mean that all would arrive in a day's time, counting from the starting of the first vehicle. It means only that the time on the road of each vehicle would be less than a day.

by fast-going autocars could do double the distance at least that the omnibuses could accomplish. There would be in London and the neighbourhood at least 10,000 such vehicles, which, at a low estimate, could carry 40,000 men. I give the number at 10,000 in order to keep well within the mark, begging only that it will be remembered that the number is being augmented by hundreds every month.

Road transport for goods by mechanical power is also rapidly increasing. I may mention that already such a firm as Pickford's have power haulage equal to 480 tons load; that many other companies are rapidly superseding horse power for conveying goods, one great firm being in course of substituting 300 power-driven vans for horse-hauled vehicles. These are indications of how the wind is blowing. And, be it remembered, that such goods wagons could on emergency carry large numbers of men as well as *matériel*. Can anyone doubt, in face of these facts, that if it is possible to utilise promptly and efficiently the power vehicles we possess, in the event of a national emergency arising, the advent of the motor road vehicle has added enormously to our defensive power?

But the value of this mode of utilising the road is not to be measured merely by the general convenience for free and fast transit which it presents. It is obvious that even if other things are only equal, the efficient road vehicle has another very great advantage over rail transit. A railway line approaching a coast has only one head. It necessarily, if it be a line coming from a central place, has one terminus at the coast. When troops are brought up by it they have still to be distributed over the line of coast which it may be necessary to guard against the attempt of an expeditionary force endeavouring to effect a landing or landings. Therefore if the troops are brought by rail they must be distributed either by coast lines or by road marches, or by both, to the points at which the strategist conducting the defence desires to post them, and thus will necessarily take longer time in reaching the place where they are required. Whereas if troops are being brought forward by road they can be distributed from intermediate places direct by road to their different stations. For example, if the Yorkshire coast was threatened, and a force of 20,000 or 30,000 men was drawn to Manchester from the West, and was moved on with orders to report at Leeds, the commander of the forces, learning of the dispatch by telegraph, could, by telegram to Leeds, order the whole or part to proceed from Leeds in the direction of Hull, or the whole or part in the direction of Scarborough, through York, or the whole or part on Whitby, being always able to keep in touch with them by the telegraph or motor cycle, as they passed through towns and villages, so as to have them thoroughly in hand for any change of disposition, either of direction or diversion in different directions, that might be necessary in consequence of the enemy's movements. For example, he could change their direction by telegraph from Hull and send a column northwards to Stockton and Middlesbrough, whereas he could have no such freedom in dealing with the troops if once they were in trains moving on a fixed railway line. When the troops are once entrained they are committed to such routes only as are laid with rails. There is no choice of roads, no possibility of freely changing direction. Flexibility in movement is impossible. The troops are, as it were, locked up in boxes, dispatched under a time table, and the Chief Command must wait until they are liberated before he can deal effectively in directing their detail movements. On the other hand, when he has them

on roads he can convey effective orders to them at any time by dispatch sent to intercept them, or by use of the telegraph to communicate with the commander or the staff officer going with the troops, and the change of direction can be effected without the loss of a minute of time. In short, he would have as much freedom in dealing with them as he would have if they were on foot march at 2½ to 3 miles an hour, with the advantage that he could calculate that they were making their way in the general direction of advance at a speed equal to five times that possible by marching, and without limit as to distance, and that they were able to move at the rate of more than 150 miles a day, arriving unfatigued and ready for action. In short, such a mode of conveyance gives the maximum of facility to modify plans, to move freely, and to change direction. On the other hand, the railroad is the very worst mode of conveyance, if any sudden change of plans and consequent change of destination of troops is necessary.

Further, a mode of conveyance by power vehicle on the road would be of great value after the front had been reached in enabling the commander to transfer large bodies of men in any direction he pleased and without an hour's delay. He would have the further advantage of freedom from the necessity of considering any question of fatigue, and would be certain that he could move them from one part of the coast to another by direct journey and at a much higher speed than that which an expeditionary force moving by sea could possibly attain, and bring them to the desired point thoroughly fresh and fit. Nor would he have to consider the condition of animals—always a very serious matter in land war operations. His road vehicles would only require overhaul, oiling up and fuel; there would be no need to give time for recuperation of exhausted energy. This would be of priceless value, not only as regards conveyance of troops, but even more as regards transport haulage. There would be no such ghastly and wasteful using up of horseflesh, as so often takes place in war, when at times the salvation of a force and the avoidance of a military disaster can only be effected by a cruel exhaustion of animal power. The power vehicle may be injured or may fail, but it can be towed with its load, and can be mended, whereas the overworked horse must often perish, and the call upon other horses to do its work as well as their own means still further destruction.

All that I am saying in favour of the power vehicle may seem like an idle dream to those who have not given attention to what is being practically accomplished by power haulage at the present time. But so certain do those who are observant feel, that they can confidently say that what is already in actual operation exceeds all that could have been pictured by the wildest dreamer of twenty years ago. And to no country in the world does this development present such inestimable advantages for land defence as it does to our own, provided only some of the deep thinking, of which we hear so much, is devoted to it.

Time will not permit that any elaborate detail should be stated for the carrying out of the preparation for a practical use of power haulage in national defence; but I may in a general way, and as giving points for criticism and discussion, suggest in outline what might be the preparatory organisation for such a transportation of troops and their necessary munitions, etc. For, of course, without some definite arrangement made in time of peace, there might be much dangerous delay and confusion when the time for action came, especially as it

must be assumed that it would come suddenly. An attempt to improvise might prove a disastrous failure. Any Power which aimed at a military raid on this country would necessarily endeavour to make it as much as possible a surprise, and probably make feints in one direction or more, while the real expedition was intended to act in another quarter altogether. The problem therefore is to have such an organisation ready for application as will ensure an orderly, rapid, and efficient transfer of troops from any one part of the country to another, to bring them to the front, and to move them as required when there.

To make due preparation in time of peace for such work in the event of an imminent invasive attack, the following are suggested as steps to be taken:—

*First.*—A register for each great town, and a register for each county or convenient sub-division of a county, of all the power vehicles classified as private cars, public passenger conveyances, and slow traction vehicles, with the carrying capacity and horse-power of each.

*Second.*—A register of all places where fuel for internal combustion engines is stored.

*Third.*—A power given to the Sovereign in Council when invasion is threatened to issue requisitions for the services of motor vehicles and registered drivers, and requisitions for supply of fuel for the vehicles, all on terms duly adjusted and published in time of peace.

*Fourth.*—Rendezvous to be fixed for the assembly of power vehicles, to which the vehicles of the place and neighbourhood shall proceed respectively on proclamation being made for such assembly in any particular town or district.

*Fifth.*—A staff to organise the dispatch or reception of power vehicles—and if need be, re-dispatch—according to the direction in which the movement for the coast requires to be made, or to be altered from time to time.

For this purpose I would suggest that the whole country be mapped out into districts, and that for each of these districts there be a staff appointed to take charge of, and dispatch troops from the district or through the district by road in any direction ordered through the General Staff. This local dispatching staff might be selected from officers on the Army Reserve, the senior in each place being one who had served in the Regular Army, and the subordinates being retired officers of good report in the Auxiliary Forces, of whom there are many of practical experience in handling men, but who from exigencies of business or other causes have been compelled to resign, while still quite fit to serve, and most willing to do so on emergency. When there is sufficient choice the gentlemen selected from both classes should have some practical knowledge of the power vehicle. This staff when appointed would be required to organise their districts, fixing for the different towns and villages what motor vehicles were to proceed to the various rendezvous on proclamation being issued, so as to ensure an adequate supply of vehicles for the troops to be conveyed.

It is not possible now to give even an outline of all the detail arrangements for working out the movement of troops by the road in this manner when a summons came to be sent out for assembly to resist invasion; but the idea would be, that the vehicles as they arrived at the rendezvous should be marshalled in classes according to horse-power and speed, and that the troops as they arrived should be sent off in groups of cars, each group under an officer. All the marksmen of the corps might be sent off first in charge of an officer and musketry

instructor in the fastest cars, so as to reach the front as soon as possible. It should be part of the orders that every man should bring with him sufficient food for two days, for which he would be compensated. This would make it the more easy to alter routes with freedom. If food had to be provided for the troops as corps or even as companies during the journey, it might cause delay, and would make it impossible to alter direction at any part of the route where it might be desired to do so, according to the changing exigencies of the situation.

Each vehicle would require to be provided with the fuel necessary to bring it to the outmost point towards which it was to go on its first journey.

All vehicles which could only take two persons would be used to carry forward spare ammunition with the troops, the driver only riding on the car. Some of the faster of these could be utilised to carry staff officers.

When the high-speed passenger-carrying vehicles had been dispatched, any remaining troops would be sent forward in the heavier class of vehicles, and the remainder of these vehicles would be held by the motor staff at the disposal of the supply and transport officers for commissariat and other supply services, including the sending forward in bulk as it was collected from the registered depôts the fuel necessary for replenishing the road vehicles.

If time permitted I would like to describe how easy it would be to set up camping shelter by the use of motor vehicles as supports for canvas sheeting, after the excellent device of my late friend, Captain Tomkins, called the tortoise tent. A tortoise tent stretched out from a motor omnibus or limousine or landaulette car could accommodate 150 men with ease, and the tent part of the arrangement would not occupy more space when folded up that two ordinary bell tents taking 14 men each. I have had similar tent accommodation in camp, and it was in every way satisfactory.

There are many other valuable services which could be rendered by the power vehicle at the scene of conflict, such as towing great guns from place to place, towing field guns when on the road, so as to keep the horse teams fresh for over-country work in heavy ground, and up steep ascents. They would also afford excellent cover to a resisting force, in the event of any portion of the enemy succeeding in landing. They could be kept under cover ready for use, and so enable an overwhelmed force to hold on much longer than it otherwise could be allowed to do, the vehicles being ready for rapid withdrawal before an enemy that had no fast conveyance available. The motor vehicle would be to the defending troops what the ponies so often were to the Boers: a means of getting safely out of range when things were becoming critical, of course, with this limit, that they must keep on the roads.

In all that I have said it is only the motor vehicle that is the property of the private citizen or company that has been spoken of, whether it be a carriage for persons or for goods; but, of course, I assume that in the near future, if not already, the war authority will follow the lead of the citizen, and adopt the power vehicle as part of the military organisation for purposes connected with war.[1] The

[1] Since this was written it is satisfactory to learn that the War Department has taken the step of arranging for the registration of motor vans and omnibuses for purchase or hire when necessary.

adaptability of the heavy power vehicle to many such purposes is indisputable. For rapidly moving machine guns and their teams, for travelling workshops, telegraph and telephone wagons, ambulances, and for conveyance of bulk material between the railways and the camps, the power vehicle can render service far beyond what can be accomplished by animal power. Moreover, a motor vehicle for military purposes can have a capstan drum, which, when put in gear, can be used for warping purposes with block and tackle; steep ascents can be overcome, so that even the heaviest guns can be taken up stiff gradients without difficulty, and trench ploughing can be executed without the necessity for special engines. Motor bicycles can also be used in the regular service for rapid conveyance of intelligence and orders. And all this with the paramount advantage that a commander can be sure that he has abundance of power for conveyance and for mechanical work, without its being an expensive and troublesome burden when idle. A parked mass of power vehicles costs nothing but the price of a little waste and cleaning oil when there is no work to be done, and the vehicles are ready at a minute's notice for work far beyond what could be accomplished by animal haulage.

We are only at the beginning of the utilisation of power traction for war. Its possibilities, and especially in national defence, are as yet not to be measured. Every month will bring new light leading to new developments. Indeed, power vehicles, if we will spend some thought and a little money on organisation now, while we have time, will, I venture to predict, prove a most valuable addition to our defensive strength on land. All I can do now is to plead that the question of its value be considered, and if it passes the ordeal of the deep thinking which is now being exercised upon our national needs, that it will not be pigeon-holed, to be considerad from a practical aspect some day, but that it will be practically dealt with now. I have some hope that it will be so dealt with now, unless the *vis inertiæ* of the permanent official is too strong for our new War Minister. I would fain believe that he will see that the provision of a sound working system for moving the troops we have is quite as urgent a matter as increasing their efficiency if not their numbers. We must take many days to bring our forces up to what they should be, and as long as they are not, the greater is the risk caused by our not being in a position to be able to use what we have with promptitude; and this we cannot do unless we fix upon our method and organise for its execution before the day of need.

It may be that we shall never have to face an expedition sent to attack us in our own land, but it is a risk against which we are bound to be prepared. One of the cheapest as well as the most practical and efficient departments of preparation would be an organisation for utilisation of the power vehicle, and I hope I have persuaded you that its use would be of the highest value. Can it be doubted that if it were known abroad that our defensive forces, whatever they might be, could and would be brought with the utmost dispatch to any part of our coast that might be threatened, with a preponderance of fire power over any force that could be collected and brought across the sea, that knowledge would have a considerable influence in the counsels of any nation that contemplated a raid? For unless we assume that the British fleet has been destroyed, a raid could only be successful if the hostile expedition effected its purposes by forcing our defences and establishing a footing before our fleet could reach the scene And what might a stubborn fire resistance not effect in

holding the enemy in check until the fleet should arrive and take up its part in silencing the enemy's guns and making untenable the position of any force attempting to land, or landed but held in check in advancing?

It is in the belief that we have in the motor vehicle a powerful addition to our potentialities for defence that my endeavour has been made to interest my countrymen in the consideration of the matter, and I conclude by earnestly commending it to their attention in the hope that our military authorities may be induced to take it up without delay and on practical lines. I suppose no one doubts that there is in our British race the pluck and stubbornness to justify Mr. Haldane's optimism as to what the people of this country would be willing to do for their native land in a national emergency. But pluck and stubbornness and willingness in a man are of no use unless he can be brought to the place where he is wanted in time. Without an organisation ready prepared for moving troops we are in the same position as regards land defence as the plucky and stubborn London Fire Brigade would be if their employers told them that they must get to the fire as best they could without horses or motors in the meantime, and assured them that they would keep on thinking what the best way might be for bringing along the means of fighting the flames to the place where they were wanted. It is earnestly to be hoped that similar folly will not be committed in the question of national defence. I have endeavoured to state what I believe to be the best means for securing that what forces we have may be rapidly brought to the place of decision. If better means exist there is no more to be said. If better can be devised, by all means let them be adopted and put in working order; but as long as the means are not fixed and not in order, the potentiality of any land defence forces we possess is only a fraction of what it should be, either as a deterrent to any other nation that might contemplate an attack, or as a resisting power if an attack were made.

Believing, as I do most firmly, that the power road-vehicle of to-day adds enormously to our facilities for effective use of our defensive forces, I would most earnestly press for a consideration of the matter, and if what I have said is accepted as true, would urge that we lose not the benefit of this valuable auxiliary to our power of rapid action on emergency, but without delay develop the necessary organisation to make it effective. It cannot be effective unless it be organised in time, and that is, before the day of need.

The CHAIRMAN (Colonel Sir R. Hennell, D.S.O.):—The Secretary has just received the following letter from the private secretary to Lord Montagu:—"Dear Sir,—I am greatly distressed to learn from your messenger, who has just arrived, that the reading of Sir John Macdonald's paper was fixed for 3 o'clock. Lord Montagu has been under the impression all along that the hour was 8, and is coming up specially from the New Forest to take the Chair at that hour. Will you kindly apologise to Sir John and to all present, and explain how it is his lordship is not there. He will, I know, be more than sorry when he hears of the mistake." As I shall probably have to leave before the discussion on this very valuable paper concludes, perhaps you will allow me to say just a word of personal thanks to my old friend, Sir John Macdonald, for his lecture this afternoon. I think he has been a little hard on Mr.

Haldane. He twits Mr. Haldane with being an "Optimist"; but Sir John is one himself. Sir John is one of our greatest "Optimists," and one of the greatest believers in the Volunteer Force. He is almost the father of the Volunteer system, and there is no man in this country who has done more for that force than he has. I think, if he will wait a few days, or perhaps a few weeks, until Mr. Haldane has enunciated his plan for a national territorial army, mainly composed of Volunteers, he will find that many of the valuable suggestions he has made in the extremely able essays he has written from time to time, during the last thirty years, on the Auxiliary Forces, together with what he has told us this afternoon, will be found not to have been over-looked in Mr. Haldane's scheme, when it is placed before the public. There is one little point in the paper which I would like, with all due deference to Sir John Macdonald, to criticise slightly. Speaking, as he did very rightly, of the value of being able to take troops along the roads by motor vehicles, he made a statement in the course of the paper which I think he will, perhaps, desire to rather modify. He says it is impossible for a commander-in-chief, or any military officer in charge of military forces, to divert the troops when they are moved by railway. I think, considering that in this country we have stations every few miles, sometimes under a mile, troops moving by our railways can be diverted at any point under instructions from headquarters. But that does not at all nullify Sir John's able dissertation on the enormous value of the motor vehicle. He, as honorary colonel of the Royal Motor Reserve, will, I hope, be in the position to see that this scheme for Volunter Auxiliary road transport is taken the greatest advantage of at the War Office. I would only add that, as an old soldier, and one who commanded a Volunteer battalion for over ten years, I am in perfect accord with Sir John Madonald in all he has said, as to the value of Volunteer motor transport, as well as all he has written in the past as to the great potential resources the nation possesses in the Volunteer Force. Assets of a military character, which exists in our civilian population, which only requires to be tapped and encouraged, to be the bedrock and backbone of a National Army. The Army Motor Reserve, of which Sir John Macdonald is honorary colonel, now an integral part of His Majesty's Regular Forces, is but another proof of this fact.

Mr. Edwin N. Henwood, I.N.A. :—I would thank you to listen to a few remarks, because I know that the French Government are taking very particular interest in this question of conveying troops by motor wagons and motor vehicles all over the country. In addition, they have taken particular interest in a resilient wheel, which will enable travelling by motor on ordinary roads to be infinitely more comfortable and reliable than it can be at the present time by the use of any description of rubber-tyred vehicle. It is a wheel which enables the load of the carriage to be distributed upon a considerable amount of rubber, so that travelling over the roughest roads will be rendered much less difficult. I may also mention that some other foreign Governments are taking particular interest in the question of moving troops and materials by motor vehicles. I know that in the late South African War certain motor traction engines were taken out and were used for the haulage of provisions, materials, and fodder for the horses over long distances, which could not have been undertaken by ordinary horse transport; and, therefore, we have every reason to congratulate the author upon having drawn public attention to this subject.

Major R. Murray Lawes, R.G.A. (Mil.):—I am sure we owe a very deep debt of gratitude to Colonel Macdonald for bringing this most important question before us. As one of the commanding officers of our fast expiring submarine mining divisions, it might, perhaps, be thought that this branch of the Intelligence Service of the War Office did not affect us; but we have often conferred amongst ourselves privately as to the various reports coming from those sides of the Channel from which we might be attacked, especially with a view as to the speed necessary for laying out our mine fields in the Nore and Thames. We have ascertained privately at different times, in spite of all we have been told at this Institution on many occasions, that large forces of troops could (remarks as to dinghies are rubbish) be landed on our shores, and that the only means of opposing those forces at various points on our coast are the means by which large forces of about twenty or thirty thousand men could be moved almost momentarily, and placed near the spot where the invading force is likely to be landed. For instance, there is the east coast, Sherringham, and the south coast, Torquay, Shoreham, Whitstable, and all sorts of places further up north, where large forces could be landed. Therefore, if we are to send a force of men to engage the enemy, that force must be placed at some place in the centre of England, say Reading, Oxford, or some town in a position which is in communication with the spokes of the main roads which run out of London. If a force, having a large number of motors, were placed, say, at Reading, it would be available for despatch to Bristol, the whole south coast, Sherringham, or Brightlingsea, or even, perhaps, as far as Hull. I believe that is a thing which could not be done by the railway. Troops in motors could be almost treated as units themselves. They could be moved with provisions, which would last for four or five days at least; and if the motors carried machine gun detachments, those machine gun detachments would be more valuable, perhaps, than fifty men, when firing into crowded boats, and less exposed to the scouring fire from battle-ships. If you carry two guns on every motor, with the men to man them and spare ammunition, those guns, if they were brought to the places immediately where landings were likely to take place, would have the very greatest effect in averting the disaster, to which at the present moment there is no doubt this country is exposed. I must thank Colonel Macdonald and the Council of the Institution for bringing this most important question before us. One very important point to bear in mind is, that the motors can carry tents about with them, or the men can live in a motor if it has a cover. In that way they can move about from one place to another like gipsies. That sort of thing, I believe, has never been done; you cannot do it by using a train, and it never will be done in any other way than by using motor cars. But I think in adopting motor car traction for military purposes a little common sense will have to be used. It has been customary in the ordinary way to move the cavalry to the front in any expedition. If a general were to do that nowadays, and back the cavalry up with troops conveyed in pneumatic-tyred motors, I think a very great mistake would be made, because this is what would happen: You would have your cavalry going along the road kicking up the stones and flints, and making it almost impossible for pneumatic-tyred vehicles to use those roads. I think at the present time the motors and cyclists should go before the cavalry. If the motors and their detachments are lost, they must be sacrificed—you must have some losses in war. But if you put the cavalry in front of the motors, the whole force would be decomposed. The men in the

motor cars would be in the ditches most of the time mending their tyres, and would be of no use at all; but if they were put in front they might render most efficient service, and if they were lost it would not matter. It would stop the landing to a certain extent until the main force came up. I believe we have had some experience of that kind in the Boer War lately. I fancy General Buller was very much disconcerted with the way in which the Boers managed to move 10,000 men from one place to another whenever we tried to attack them; they moved on horseback across the country. In the same way, on our roads we could easily move men on motors, and do exactly the same thing as the Boers did when they surprised us. In conclusion, I again desire to thank Colonel Macdonald for his interesting paper.

Captain H. H. POUNDS (Australian Forces):—As a visitor from Australia, I have been deeply interested in this most admirable lecture, and there is one remark I would like to make concerning the difficulty of the transport of troops on railways. I served throughout the Boer War with an Australian contingent, and I frequently saw the very great difficulties that occurred on the railways. There is one important item which Sir John has omitted to mention in connection with the advantages of motors over railways, namely, the liability of bridges and culverts to be blown up during war. On many occasions on the various lines in South Africa the railway traffic was absolutely disorganised because the bridges and culverts were blown up, not only before but behind the trains. With regard to the Chairman's criticism as to the ease with which traffic can be diverted, I would like to refer to one particular incident, which is within my knowledge, in which Lord Kitchener and Sir Percy Girouard were interested. It occurred during the latter part of the war, when a series of raids were organised in the Western Orange River. Lord Kitchener instructed Sir Percy Girouard that he required so many trains at a particular point at a particular time to move a number of men to a definite spot. Sir Percy Girouard told Lord Kitchener that he could not possibly do it; Lord Kitchener told him he had got to do it somehow. Sir Percy Girouard replied that it was impossible, but that he would do his best. He started to send the trains along. Naturally, as an expert railway man in such a matter, when the trains got to the end of the journey he wished to bring them back to take more troops; but he could not send them along fast enough for Lord Kitchener. Lord Kitchener told Sir Percy that he must work quicker. Sir Percy Girouard told him he could not, so Lord Kitchener said: "I'll do the job myself." Lord Kitchener thought he knew how to do it, and he tried, with the result that he got the whole of the lines blocked up and could not get his empty trains back again to carry the men. Eventually the result was that he wired to Sir Percy Girouard to do the job himself. I only mention that little incident as a practical illustration of the difficulty of diverting railway traffic.

Mr. SHRAPNELL SMITH:—I am here by invitation as the representative of the Motor Van, Wagon, and Omnibus Users' Association, one of the bodies which contributed to the arranging of the scheme of registration to which Colonel Macdonald has referred. I am very considerably interested in much of the contents of this paper. It seems to me that this country stands to gain a great deal more than any other European country from the point of view of the organisation of the motor vehicles of the country, by reason of the fact that, whilst the mileage of our roads is not greater in the aggregate than one finds in other countries, the percentage

of our roads to the area of the country is so very much greater. Therefore, access to the different points along the coast is much more easy than in any other country of Europe, and of course much more so than in any other less developed country in the world. In the course of his paper, Sir John has suggested the adoption of certain procedure in connection with the possible arrangements of this auxiliary force for repelling the invasion of this country. I venture to remind him that the first suggestion he makes, namely, the completion of a register of motor vehicles for each town and county, already exists under the Motor Car Act of 1903. Therefore there would be no difficulty in gaining possession of a proper list of owners. But when one comes to the second suggestion: A register of all places where fuel for internal-combustion engines can be obtained, it immediately brings one up against the sore point, that we are dependent upon an imported fuel for the driving of so many of these motor vehicles. For the last ten years—ever since I became interested in the question of heavy motor traffic—I, in common with others, have always spoken out for the steam vehicle as having a future before it. Although it has been a popular idea that the internal-combustion engine was going to put steam out of court altogether, it is satisfactory, I think, in this connection, especially from the point of view of the heavier machines, to know that there are a very large number of steam-propelled vehicles in this country which would be dependent only upon coal or coke and water, and not upon any imported fuel; and also that, as matters are developing now in connection with motor omnibuses, there is every likelihood of a large percentage of vehicles propelled by steam coming into use. There is one general remark I would like to make on the subject of the lecture, namely, that anything on the lines suggested with regard to the organisation of motor vehicles for defensive purposes would, I am afraid, be hopeless if it were not rehearsed in advance. If the motor 'bus drivers of London especially—I am not referring so much to the drivers of private vehicles, because they are used to going about the country to a very considerable extent—were called upon to go from London to the Norfolk coast, and take down twenty or thirty passengers in each omnibus, I am afraid there would be a very great many catastrophes on the road. I do not say they would be as bad as the catastrophe at Hand Cross, but I know from my experience of driving that when such men are driving in the dark on roads with which they are not acquainted a very considerable percentage of cars run into the ditch. Therefore before anything of this kind could be effective, money would need to be set aside for a considerable amount of drill.

Major C. E. I. McNalty, A.S.C.:—I have very little to say on this most interesting lecture. All that Sir John has said has been, I think, for some time in the minds of all soldiers. As Mr. Shrapnell Smith just said, there is a system of registration of vehicles in use throughout the country which is now being put into the form of an organisation, and which will be available for the future, so that, especially in times of emergency, we shall be able to call upon every one of them. I myself am in command of the mechanical transport of the Army Service Corps, serving in all parts of the United Kingdom and outside of the United Kingdom, and we have been developing on the lines of being independent as much as possible of the fuel except that of the country in which the vehicle is being worked. What Mr. Shrapnell Smith has said as to steam vehicles using fuel which is produced in the country is very true; but there is a fuel also for internal combustion engines which can be produced in every country, namely, alcohol. This fuel is being tried in

Germany and France by the Governments of those countries, and the heavy and light engines of the German Army have been using alcohol to a considerable extent for some time. In fact, the development of alcohol as a fuel is a matter of the future, to which we can look forward to with a considerable amount of certainty. If we can arrive at a really practical method of using alcohol, which can be produced in any country, we are independent of supply of fuel from other countries, and we shall obtain a fuel which is very small in bulk and weight compared with coal. The steam engines which are used mostly in omnibuses and vehicles of that nature use a heavy oil fuel instead of coal, and I think there are very few of such rapidly moving vehicles using coal; so that if we can induce engineers to develop the use of alcohol, then we have something in the United Kingdom which will make us independent of outside.

Colonel Sir JOHN MACDONALD, in reply, said:—I must begin by expressing my very sincere thanks to the gentlemen who have criticised my views, for the very kind way in which they have dealt with my lecture. Their remarks lead me to believe that there is something practical in the paper, and I hope the consideration of it will not die down, as motor traction died seventy years ago through being smothered by the railway companies and the lords and squires who did not favour a new thing being brought in, with the result that for seventy years we have not had the means of locomotion which we might have had. The motor car is now well established as a mode of safe locomotion, and let us hope it will be well considered, and that as soon as possible, from a military point of view. I was glad to hear what Mr. Henwood said, because I noticed the other day that General Picquart, the French War Minister, is making a register in France of all motor cars that are suitable for the purpose of carrying troops, which shows that he is quite alive in his Department to the present importance of the matter. I hope that his spirit will be infectious, and that it will infect our own Department. I hope it will be a microbe which will be beneficial and not injurious. Sir Reginald Hennell criticised, and very justly, one remark I made. Perhaps I may have made it too strongly. I did not intend to state that it was impossible, when you had started troops off in trains, to divert them at certain points if you wished to divert them. What I intended to express was this: That one might just as well not have a fast transit from one place to another by railway if, when the journey is half done, you have to stop the trains at a particular place, take the troops out of the trains, and put them in other trains to send them somewhere else, because you cannot do it without great loss of time. As I have said before, your railway line must be worked by a time-table, and a general cannot subvert that time-table, certainly within twenty-four hours. It cannot be done. The safety of the line requires that the officials should know what trains they are going to run and whither. Captain Pounds told us of an attempt made in the South African War by a very distinguished general to take over the management of a railway line from a railway expert, and how he came to grief; but that, of course, is entirely confidential between ourselves; we shall not say anything about it, although it is instructive. But with motor traction you may have a string of several hundred motor cars coming along the road, the fastest ones in front, leaving a good gap between them and the next lot. When the fastest ones arrive at a particular place, the staff officer can meet them at, say, the junction of two roads, and by the motion of his hand send them to the right or to the left. For instance,

instead of going to Hull he sends some of them to Scarborough, and others to Whitby, and others to Sunderland. It is done without the loss of a single minute of time. Another speaker expressed an opinion about the difficulties of transport by railway, with which I agree. As regards the use of the autocar for camping purposes, there is no doubt it can be done. In that connection I only wish more attention had been paid to the tortoise tent. I had a tent in my camp; I think it covered a space nearly as big as this room. It accommodated 150 men, and the whole thing was packed in about 4 feet by 3 feet by one foot. It could be put on the top of a wagon, spread out and pegged down, and there you had at once a sleeping place, dry and comfortable, for that number. With such an arrangement of an autocar with a tortoise tent, the soldiers could live, as one of the speakers said, like gipsies. I think they would live a little more comfortably and be a good deal cleaner, but certainly it would be a satisfactory mode of sheltering troops, because the expense, trouble, and annoyance of carrying about a vast number of bell tents in separate wagons are very great, whereas in this case the same vehicle that is carrying the troops also carries the tent with it. That is the reason it is called the tortoise tent: it carries its own cover on its back. As regards what was said about the cavalry, up to now we have always sent the cavalry to the front, and is it not obvious why that was done? The generals sent the troops that could move the fastest to the front, and in the olden days the troops that could move quickest were the cavalry. Therefore they always went to the front; but nowadays the cavalry cannot move nearly so fast as the infantry can move in motor cars; they cannot do a third of the distance in the same time, and therefore I certainly would not send the cavalry by road nowadays. As I say in my paper, I should leave the railway to carry the cavalry, the artillery, the *matériel* of war, and what was necessary for the immediate use of the columns. The cavalry and the artillery should not be allowed to block up and destroy the roads; the roads should be left for the conveyance of the infantry, and should be kept in good order.[1] Mr. Shrapnell Smith, who knows more about these things than most of us do, said that there were registers of motor cars already in existence in this country. That is quite true; but they are not available in the way in which I wish them to be made available. I want the cars to be classified for suitable places and towns in particular districts. You can get all the materials for information out of the existing registers, but these registers would not be satisfactory for the purpose for which the military authorities require them. You must have new registers under the charge of a staff, to which is assigned the duty of organising this mode of military transport and keeping it organised. With regard to the question of fuel, I do not want to say anything against steam, but the chief difficulty is that most autocars are driven by gentlemen who know nothing about steam. The steam vehicle is an excellent vehicle in the hands of a skilled man, but it is the most useless of vehicles in the hands of an ignorant person. A man can learn a good deal about driving an internal-combustion engine in a very short time, but very few men would be capable of learning really efficiently to take charge of and drive a steam

[1] I would add that the cavalry should not be allowed to use the centre of the road, but should move in two ranks close to the edge of the road on each side. There should also be a road mending corps, men hired and working under the regular roadmen and road surveyors. Of course, I am speaking of home defence only.—J.H.A.M.

carriage without a considerable number of months' training. Then it was suggested that a difficulty would occur with regard to the fuel. I do not think so. I think we may be certain that, at the present moment, we have fuel enough in this country to last us for at least a month or six weeks as regards any military operations which we may require, and if at the end of a month or six weeks the business is not finished, we need not trouble ourselves any more about fuel. In that time we should either have driven the enemy off, or else the enemy would have compelled us to make the best terms we could. Therefore there is no fear about that. Then Mr. Shrapnell Smith also said, and I quite agree with him, that it would be a somewhat serious thing to send off a number of London omnibus drivers to drive 'buses containing troops, say, down to Southampton. Yes, but in a national emergency it has to be done. If you send 500 omnibus drivers down to Southampton, you must take the risk of some of them not getting there. Even if fifteen or twenty of them come to grief, you can afford to lose them. The thing has to be done, and you must do the best you can. You must not consider too much the little accidents that may happen. Even if only 250 out of 300 get down safely, it does not matter much what happens to the others; they would be brought on by the next vehicles that came along; and let us hope the casualties that would happen, both of injury and delay, would be very small compared with the casualties that are sure to happen once the enemy gets upon our shores and we have to fight him off. It does not matter whether you get your leg broken in a motor car accident or whether you get a bullet in your leg from an enemy, it all comes to the same thing. You must get the force forward at any risk of some loss in doing so. One train in a smash would kill and injure more soldiers than 20 motor breakdowns. I am exceedingly obliged to you for the way in which this paper has been received. Any amount of labour that I can give to the subject I shall only be too pleased to devote to it. Allow me before I sit down to ask you to give a hearty vote of thanks to Sir Reginald Hennell, who has so kindly presided. He is an old friend of mine, and I feel very much obliged to him for taking the Chair at a moment's notice.

# MILITARY DEFENCE WORK BY CIVIL ENGINEERS.

*By G. LACY GOOD, M.Inst.C.E., M.S.A.*

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Thursday, 1st November, 1906, at 3 p.m.

Brigadier-General R. M. RUCK, R.E., Director of Fortifications and Works, in the Chair.

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DURING the recent war in South Africa, whilst Government Engineer in charge of the first District of the Klipplaat-Oudtshoorn railway construction, the author was consulted by the military authorities upon the best means of placing Klipplaat in a proper state of defence.

This Midland village, which, besides a church, magistrate's court, gaol and police station, consists only of a small hotel, a couple of stores, and a few scattered houses, was, nevertheless, of considerable strategic importance, being the newly-formed junction of the Port Elizabeth, Graaf Reinet and Oudtshoorn lines of railway, at the same time forming a depôt of the Army Service Corps and a remount station. Furthermore, during the second invasion of the Colony, the Boer commandoes were very active in the immediate neighbourhood, wrecking trains, destroying Government buildings, burning homesteads, etc., on one occasion burning some 30,000 sleepers and destroying every temporary bridge and tank stand over a length of about 20 miles on the new railway.

At the time referred to—the early part of 1901—the only defence works that existed at Klipplaat were a roughly built stone fort on the most commanding hill, and a small blockhouse, formed of sandbags, near the railway station.

The author's recommendation was, accordingly, that the number of forts or blockhouses should be increased by three, undertaking himself, in conjunction with other Government officials and civilians, to man one of the forts, that to be more particularly described, whenever the enemy might threaten the place.

Sites were accordingly selected and triangulation made, in order to ascertain the ranges, etc., and the erection of the additional blockhouses was commenced at once.

The methods of construction adopted will now be given.

In order to increase the advantage the gentle rise selected for the fort, of which illustrations are given, already afforded, and at the same time to get an all-round fire, as well as secure a covered entrance, the author decided to build up a base 6 or 7 feet in height, of stone and dèbris filling, suitable material being obtainable from

the walls of a cattle kraal, which it was deemed advisable to level with the ground, owing to the possibility of its affording cover to an attacking force.

The superstructure it was decided to form of sandbags and Tasmanian stringy bark sleepers.

Before settling the form of construction, however, a number of experiments were tried in connection with the penetrative power of the Lee-Enfield rifle, the annexed table giving the results obtained.

A scrutiny of this table will give some idea of the marvellous propulsive power of cordite behind a nickel pointed bullet.

*Experiments made to determine the Penetrative Power of the Lee-Enfield Rifle. Point-blank range—15 yards.*

| Materials Tested. | Penetration. | Remarks. |
|---|---|---|
| | inches. | |
| 10 by 5 inches Tasmanian Stringy Bark Sleepers ... | 19 | Three Sleepers being placed close together on the flat. |
| 10 by 5 inches Creosoted Baltic Fir Sleepers ... | 31 | Four Sleepers being placed close together on the flat. |
| Two $\frac{5}{16}$-inch Galvanised Iron Telegraph Anchor Plates | $\frac{3}{8}$ | Passes right through, tearing a hole 1-inch square out of the back plate. |
| Ditto ... ... ... ... | — | Striking at an angle of 45°, bulges both plates without perforating. |
| Portland Cement Concrete | 3 | Splitting a piece 6 inches thick. |
| $\frac{7}{16}$-inch web of 60 lb. Carnegie Steel Rail ... | — | Bulges the web. The experiment was tried upon a 3 feet length of rail, which the bullet overturned. |
| Gravelly Sand placed between two $1\frac{1}{2}$-inch Boards | 10 | Bullet flattens and splits against the gravel. |

I should mention that the projectile appeared none the worse after penetrating the timber, but always flattened or broke up in contact with the gravel. It will, of course, be remembered that the Boers invading the Colony possessed no artillery, and that it was not necessary, therefore, to provide against anything but rifle fire.

As the contractor for the railway works had a large stock of material at Klipplaat, both Tasmanian and Baltic sleepers were obtainable near at hand.

From a reference to the accompanying diagrams it will be seen that the first four courses of the fort proper, which was circular in plan, were formed of double rows of sacks, filled with gravelly sand, laid as stretchers, each bag measuring about 2 feet 10 inches by 1 foot 10 inches by 10 inches when compressed, their weight being about 400 lbs. Upon these, at a height of 3 feet 4 inches above the main deck or platform, a double octagon of 7 feet by 10 inches by 5 inches Tasmanian stringy bark sleepers was arranged in groups of six, giving a thickness of 30 inches, the ends of the sleepers being set at 4 inches apart; the embrasures, or portholes thus formed, having an angle of fire of 45°, fire from each pair of ports intersecting at

about 6 or 7 feet from the outside of the fort. Each group of six sleepers was strongly bound together with strap iron, and on either side of each embrasure two 3-16 inch galvanised iron telegraph anchor plates were bolted on to the sleepers, in order to deflect any bullet that might pierce the timber obliquely. Above the sleeper courses the bag work was continued, a look-out bridge, or sentry walk being thrown across at a height of 7 feet 6 inches above the main deck, or 14 feet 6 inches above the ground. The decking of this gangway, which was formed of creosoted Baltic fir sleepers 7 feet by 10 inches by 5 inches, was supported by two 60 lb. Carnegie steel rails, access to the bridge being obtained by projecting steps and man-ropes. The sandbags, forming the bulwarks of the bridge, were pierced in six places for rifle fire, the embrasures being shaped by wooden boxes. From the bridge a commanding view was obtained, over the bush, etc., of the other forts and surrounding country.

Protecting the covered way into the blockhouse was a mantelet of sandbags, 7 feet 6 inches in height, with an entrance at one corner, an embrasure being formed through the bags, commanding the approach pathway. Altogether 23 loop holes were provided. It had been intended to have erected an outer wall, 7 feet in height, round the base of the fort, but there was not sufficient stone available.

In order to give each of the crew absolute immunity from all but a shot entering directly through his particular port hole, a bullet-proof shield of gravel, filled in between timber sheeting, was erected inside the fort, which shield at the same time gave protection to the water tank and ammunition.

As will be seen from the gun racks under the port holes, etc., everything in this fort was arranged in man-of-war fashion, each man having his station, and rifle to hand.

Over all, from a flagstaff, formed of telegraph poles, floated the Union flag.

At a distance of 50 feet from the stone base to the fort, a barbed wire entanglement was erected, and, as this was specially designed, views of it are given in the plate. Tins with stones in them, forming alarm rattles, were fixed all round the topmost wire, and, as all the wires were laced together, none could be tampered with without the rattles announcing it.

With regard to the other two additional forts the author has pleasure in referring to one designed and erected by Mr. L. E. Heberden, first assistant engineer. This fort was formed entirely of 60 lb. steel rails, bonded flush at the angles. The flooring of this fort, which was 24 feet square inside, was fixed at a height of about 4 feet above the ground, upon a stack of rails already lying in the contractor's yard. The sides were made 7 feet high, and the whole roofed in with rails laid close together, 24 embrasures being formed by spacing 3-feet lengths, that had been cut for expropriation beacons, 6 inches apart, fire from each pair of embrasures intersecting close to the outside of the fort.

Undoubtedly, with the exception of the fine, cut stone forts, built to protect the great railway bridges, this steel fort was the most serviceable of the whole chain of blockhouses erected during the war. It must be borne in mind, however, that such a form of construction could only be economically and rapidly constructed at spots where rails in large quantities were stacked.

The third blockhouse was constructed on a raised platform of stones, with two concentric sheets of corrugated iron set 2 feet apart, and filled with gravelly sand, the sheets of iron being supplied, ready rolled into shape, and pierced for rifle fire, with the necessary timber framing, from the Uitenhage locomotive shops. This system, a rough and ready but very effective one, was, latterly, generally adopted throughout the long line of blockhouses, the iron being painted brown to assimilate with the surrounding landscape.

Later on a sixth blockhouse, commanding the Port Elizabeth road, was erected, being built of stones, and pierced for 20 rifles.

Whilst, from an engineering point of view, the works above described are of small importance, the conditions under which they were carried out, and their value from a military standpoint, must not be overlooked. On several occasions the forts had to be hastily manned, whilst three, including the first described, were in course of construction, owing to the enemy's threatening demonstrations in the near neighbourhood. Then the author had no skilled labour at his disposal and no plant; it will therefore be readily understood that the handling of some 500 sandbags each weighing about 400 lbs., and raising these from 7 to 20 feet above the ground, was no light work. By using a couple of rails as slides, and parbuckling, double purchase was obtained and the work lightened.

The author might here suggest certain improvements in those useful machines, the railway velocipedes, with which he was able to assist the scouting parties.

Those supplied for use on the Klipplaat-Oudtshoorn Railway were not provided with guards in front of the wheels, consequently, the tyres were always getting dented and the spokes loosened by contact with stones on the line, great risk being also run of the machine being thrown off the rails. The author rectified this on his by fixing steel guards, with a stiff piece of leather clamped on, which actually touched the rails, at an angle of 45°, stones measuring 4 inches diameter being therewith swept clear of the line. Another weakness was in the india-rubber tyres, which, being only glued on, frequently became detached, rendering further progress impossible without destroying the thin steel tyre and spoke attachments. This could easily be rectified by the provision of a rim to the outside edge of the steel tyre over which the rubber could be stretched.

These may seem small matters, but on one occasion the author was prevented ambushing a party of 11 Boers by the rubber tyre, thus springing off when he had got about half way to a point on the main line to Port Elizabeth, where they were expected to, and did eventually, cross.

It should be mentioned that, during the whole of the time referred to, and up to the time peace was declared, the work of construction was proceeding on the Klipplaat-Oudtshoorn railway, necessitating the supervision of the Government Engineers. The fact that Klipplaat was never attacked, in no way detracts from, but rather emphasises, the utility of the forts and other defensive works, and it may be taken as the greatest compliment the enemy could have paid it, that, whilst spreading destruction far and near, he always gave this place a wide berth.

Acting concurrently with the author, further down the line, colleagues of his, both on the Government and contractor's (Mr. A. F. Hills, Chairman of the Thames Ironworks Co.) staffs, devoted

their energies to the defence of other strategic centres, laying mines round the towns and villages, forming telephonic communication with the blockhouses, mining, and barricading the mountain ravines, through which the Oudtshoorn railway passes, etc.

An excellent idea can be formed of the measures taken to bar the passage of an invading force at Toverwater Poort, a ravine on the Klipplaat-Oudtshoorn Railway, about 82 miles from the former place. (The Lecturer here exhibited some photographs of the spot in question.) The ravine, which forms the bed of the Traka River, the main tributary of the Oliphant's River, is about two miles in length, and from 80 to 100 yards in width, the precipitous sides towering to a height of about 700 feet.

In addition to the fort there constructed, three concealed charges of dynamite were laid in front and rear of the fort, arrangements being made to explode them by electricity. At points, above and below, the bed of the ravine had also been blocked by barbed wire entanglements. From an official inspection, made by the author, of these defences, he would say that it would have been impossible for the strongest commando the enemy then had in the neighbourhood to have forced a passage.

At the time of which this paper treats, the rail end had reached Toverwater Poort, and the large numbers of workmen encamped there and in the neighbourhood of Willowmore, and the quantity of material available, admitted of defence works, on a large scale, being constructed at those points, and of their being strongly manned. It should be mentioned that, with few exceptions, every engineer and workman in the Government service, so far as their duties allowed, enrolled in some local force, or gave his services willingly in some form or other, in the defence of the Colony. Nothing could have been more splendid than the devotion of the engine drivers and stokers, and it is only those who have seen wrecked trains being dragged back to the base by two powerful engines, the woodwork of the carriages and trucks destroyed by fire, and the engines pitted by bullets, that can get a true idea of the awful risks these brave fellows, unflinchingly, took.

Though in no way connected with the matter, the author thinks it would not be inappropriate to mention the unique service rendered by one of the District Engineers of the Table Bay Harbour Board, Mr. G. T. Nicholson,[1] who, near the close of the war proper, as captain in the Cape Garrison Artillery, took one of the 9·2-inch guns, the heaviest weapon ever used in land warfare, from Craig's Battery, Table Bay, up by railway to Machadodorp. This gun was of the disappearing type, and a special carriage was designed and built for its conveyance to the front, at the Salt River Railway Works, Cape Town. Photograph No. 6 gives a good idea of the appearance of the gun on its railway carriage.

It throws a shell weighing 380 lbs., of which, I believe, as much as 270 lbs. is lyddite.

The original intention, I understood at the time, was, that this gun should be used in the reduction of the Pretoria forts, but that, before it could be brought up, the place had fallen. The gun was then taken on to Machadodorp, but the only service it was put to was the

[1] Now Lieut.-Colonel, C.G.A.

shelling some Boers from a kopje, at a range of eight miles, which it appears to have done most effectively.

The author's first experience in a military capacity was whilst in charge of the Mossel Bay-Oudtshoorn Railway construction, January—March, 1901, when, as a member of the hastily formed Town Guard, he took part with a naval contingent landed from the flag-ship "Doris," and three other men-of-war, in the defence of the town of Mossel Bay.

This paper might have been extended had it been necessary to adduce further evidence to show that, should the outposts of the Empire ever again be threatened, Civil Engineers, in whatsoever part of His Majesty's Dominions they may be stationed, will come forward and freely give their services to their country.

Colonel C. B. MAYNE, R.E. :—My only regret with regard to this very interesting lecture is that Mr. Lacy Good has not given us more details of what he thinks should be done. I should like to have heard from a man of Mr. Lacy Good's experience his arguments on the wider principles involved, but at the same time perhaps such remarks had better come from a military advocate as being less prejudiced. Personally, in my career I have always advocated, wherever I have been able to do so, closer association with the civil engineers in the locality where I was stationed, subject of course to certain conditions. I would like to speak, first of all, on the subject of the opportunities for the employment of civil engineers on military works, and, secondly, on the conditions required for such employment. As regards the opportunities of employment, they may be taken as being embraced roughly in the words "stationary warfare," that is along the lines of communication, as Mr. Lacy Good was employed in South Africa, and also at our defended ports and fortresses. Along the lines of communication there are, of course, an immense number of works to be done, such as the erection of camps and huts of all kinds for all branches of the Service, the erection of defensive lines, including such fortified posts as Mr. Lacy Good threw up in South Africa, motor traction, drainage, water supply, roads, bridges, piers, wharves, workshops, etc., and railways and electric communications, which would be worked by their respective civil official staffs under the control of the military staff. Many of these various points referred to are matters of ordinary engineering; but still they are necessary, and at times we are very hard pressed for want of military officers, and are only too grateful for any help that we can receive from civil engineers. I also mentioned defended ports and fortresses. I was Commanding Royal Engineer at one of our important defended ports, and as such I had to work out the defence scheme under certain revised conditions, which scheme was accepted after reference to home with very slight modifications. At that port we had to deal with the port authorities, the municipal authorities (because there were large gas, water, drainage, and other works in the vicinity that had to be considered), and also, being a very large railway centre, there were on the spot a great number of talented railway engineers. The defence of this defended port was spread over a very considerable area, so that it was impossible for the half dozen military engineers available to attempt to do it themselves. Therefore in the scheme a very large amount of work was expected from these civil engineers belonging to these different civil departments. I had also in my charge the building works of a naval dockyard, and of course we relied on the engineering staff there as well. I pleaded (I cannot say successfully while I was there) that the work which we expected from these gentlemen should be told

them in peace time, of course in great secrecy, or at all events that it should be disclosed to the heads of the various departments. The idea was not accepted at the time, but up to the moment I left that place I fought in every way I could for the effective recognition of the principle that those who were going to be called upon for work in time of war should be informed of the part they were expected to play, so that they might be thoroughly acquainted with what was expected of them and be able to readily take up their part when the time came. In another defensive scheme out in the East, the works proposed to be carried out on the outbreak of war depended so very largely on the organisation and collection of native labour and material that it was very necessary to work the details out and arrange everything beforehand. There ought to be proper preparation and organisation, and the civil authorities ought to know what is expected from them. These are two cases in my own mind where I have done my best to obtain the co-operation of the civil engineers in the vicinity. Coming to the conditions of employment, of course the first thing to be considered is the question of military subordination, and the second point is a knowledge of the peculiar requirements of the various military units suited to their needs. That is a thing which ought to be known by those who are working for the Army and its various branches. The third point relates to the various principles of defence. As far as I can see from the plans provided by Mr. Lacy Good, there was no difficulty in picking a site for the works; but as a matter of fact, in hilly countries and in many other places, the site of the work is an extremely important consideration, which is apt to be lost sight of by those who are not, at all events to some extent, in touch with the needs of the rifle and the gun. I have in my mind a case on the Afghan frontier, where certain frontier defensive works were designed and erected by the officials of a civil department. The particular work that I am referring to was badly built, but I only refer to this fact because it played an important part in the subsequent events. The gentleman who designed and built it had no idea of the value of the siting of the fort, and of the necessity of bringing under the fire from some part of the fort what we call the "dead ground," where the enemy can collect unseen. This place, which was held by about twenty-five Sikhs, was attacked by several thousand Afghans. Although the Sikhs inflicted very heavy loss upon the Afghans, the latter crept up into the dead angles where they were unseen, and proceeded to pull the stonework down. If there had been no dead ground, the enemy would have been shot down while they were doing this, and the Sikhs would probably have been able to prolong the defence for a sufficient length of time to enable reinforcements to arrive. If civil engineers expect to play a part in the defence of our Empire, as I hope they do, there are certain conditions which they ought to make themselves acquainted with, and two of those conditions are the principles of defence as regard flank defence and dead ground, and the siting of works. One very amusing little instance took place at Lundi Kotal many years ago. There was a certain ravine near the camp from which the Afghans gave us a lot of trouble, and some very small defensive trenches had been thrown up to protect the troops, but they had been badly sited by somebody on the general's personal staff. It so happened that one day this general, who was noted for stone deafness when he did not want to understand what was said to him, came along for inspection purposes, and a very prominent general in our Army at the present time—he was then a captain—went up to him and asked him whether he might shift the defences, as they were not properly sited. As

they had been sited by an officer on the general's staff, he did not like to give this officer away. So the inspecting general replied: "I quite agree that they are very creditable to the officer who put them up." The young captain looked at him, and then walked round to the other side of the general and spoke in his other ear. This strategic movement so flabbergasted the general that, when the question was again put to him, he gave in and agreed that the trenches might be re-sited. The mere fact of these works being only three or four feet away from the proper place enabled the enemy to come up the ravine unseen at any time during the day or night. The fourth point I should like to raise is with regard to the keeping of accounts. During the last four years I have had to assist more or less in the administration of affairs dealing with South Africa, where a great many questions were raised with regard to the keeping of war accounts by those who are not accustomed to our system of military accounting. Their accounts were not made up according to recognised rules, and so gave a great deal of trouble at home; but still, if it could be arranged that civil engineers could be given some idea of the kind of accounts which should be kept, and what authority they should obtain for expenditure, it would greatly facilitate the subsequent closing up of the accounts of a war. Those are the four principal points that I think we may fairly ask civil engineers to study who are anxious to help us with regard to engineering problems in war. Military works are of extreme simplicity; but, as Mr. Lacy Good has realised (because he has referred to it in his lecture), they are required to be carried out under circumstances of great difficulty as regards the collection and application of material and skilled labour, and also as regards the speed at which they are required to be put up. What we call the military engineering course at Chatham is of value in giving details of time, material, and labour required, and the organisation of the necessary working parties so to cause the least confusion and admit of the work being executed in the most rapid manner, and also some idea of how best to make use of the materials that may be available at any particular place at the time. Those are the conditions which, I think, we may fairly ask civil engineers to undertake in peace time—to study those four points to enable them to give us that valuable help which I am certain myself and my brother officers are most anxious to receive from them. There is not the slightest doubt that the concensus of opinion, even in our military profession, is that those who have been employed on what we may call the civil engineering part of our profession are those who really do best in war. It is a great loss to any military engineer officer not to have been employed on the civil side of our professional work, so that civil engineering is really a very admirable training for those men who wish to assist us in the engineering works that are so necessary to the welfare of an Army in war. I do not know that I can say anything more on the subject, except to express my thanks to Mr. Lacy Wood for having brought the matter forward, and I hope that much good may result from the discussion here to-day. I for one am heartily in accord with the idea of co-operation between the military and civil branches of the engineering profession, as far as it can be done under the limitations, or rather the conditions, for employment that I have ventured to suggest.

Colonel G. K. Scott Moncrieff, C.I.E., R.E. :—I wish very heartily to endorse what Colonel Mayne has said about the desirability of co-operation between ourselves and our brethren in the civil engineering profession. I have had a good deal of experience in this respect, both on the frontiers of India and in China. In China the whole of the defence works in con-

nection with the defence of the British Legation at Pekin were designed and executed by an American missionary, Mr. Gamewell, who had been a civil engineer—a gentleman who was as skilful as he was brave and as modest as he was skilful. He carried out the whole of the defence works there with very great success, and when I tell you that the defence works that were carried out by other Powers in every case were driven back, while in Mr. Gamewell's case the defence advanced in the course of the siege, I think you will recognise that his work carried with it the greatest success. When, as commanding engineer of the relief column, it was my duty to take over the works which had been carried out by this ex-civil engineer, I complimented him very highly upon the work, and asked him how it was that he had gained so much military knowledge. The technical details, such, for instance, as overhead cover, thickness of parapets, of traverses, of communications, of lines of fire and so forth were all so skilfully done that I could hardly believe they had not been carried out by a professional soldier. He told me that he had been a professor of engineering at one time, and that subsequently in his missionary capacity he was constantly employed in the construction of various works for the Missionary Board, of which he was a member, and that when the thunder-cloud of war was likely to break he went to one of his military friends on the staff at Pekin and asked him to give him a few hints of a general nature. This gentleman gave him a work on fortification, which he studied and used, as I have already said, with much success. It may possibly be argued that a success of that nature does away with the necessity for a military engineer at all. I think this gentleman himself, however, would be the first to acknowledge that the reading which he accomplished was not his only instructor, but that he had to learn his work, and how to apply it, from the stern necessities of actual war itself. In other words, he was constantly exposing himself to see how he could best carry out the work; he never allowed himself any rest. Some of his colleagues were killed and wounded, but he kept pushing on the works and carefully observing what was necessary at every point. I notice that the lecturer, in his very interesting lecture, started his work by making experiments on the penetrative power of bullets—a course which I think was not only wise but admirably adapted to the circumstances. In the case of Pekin which I am alluding to, they did not require to carry out any experiments because they were carried out for them by the enemy. Although the work which this gentleman carried out on this occasion was so successful, I should hardly feel that we were justified in always placing the defence of any particular spot in the hands of civil engineers, however capable they might be, provided there were military men there who were equal to undertaking the work. Later on in the campaign we found that the services of the railway civil engineers, who had been previously employed in China, were of the greatest possible help to us. We employed them in conjunction with our own officers and men, and we found that their local knowledge, their knowledge of dealing with the natives of the country, their knowledge of the resources of the country, and so forth was of the greatest possible use in carrying out the work. I personally see no reason why there should not be this co-operation. I am aware that some officers rather objected to companies of sappers being employed under the direction of the resident engineers on the railway. I myself can see no reason why that should not be done. There was no interference with the discipline, because the officers commanding the companies had that entirely in their own hands. The resident engineer gave the directions with regard to the work that was to be done, the sappers

under their own officers carried it out. I had many colleagues on the Indian Frontier who were civil engineers, both under me and in consultation with me, and I found that the work which they did was excellent for the most part. There were, however, one or two points wherein I think their work was not quite what it might have been. For one thing, they were very much in the position of architects carrying out the wishes of clients; that is to say, they had no special knowledge of defence questions themselves, and therefore they simply looked upon themselves as the executive agents to carry out the work which infantry officers suggested. Now I think that in that respect they were not in such a favourable position as engineer officers would be who had carefully studied questions of defence. We are all aware that the opinions put forward by the officers commanding troops who have to defend a work must be treated with the greatest possible deference, and I am sure we would always do so; but, at the same time, that would not necessitate our simply following their ideas without having any sort of plan of our own. I found that in certain of the works which my civil engineering colleagues designed there were a great many points which I could not agree with. That may possibly have been my own mistake; but there was an absence of simplicity, and there was also an absence of some of the broad principles which have been drilled into us from the early days we started our professional career at Woolwich. I can only say, in conclusion, that I thank the lecturer for drawing attention to this important matter. I am sure we have, in the great civil engineering profession, a number of gentlemen who, in time of war, would be of the greatest possible use to us, and I heartily welcome any movement which would tend to a closer co-operation between the civil and military branches.

Mr. H. G. Humby (Mem. Inst. C.E.):—I was not quite prepared to be called upon to address the meeting to-day, but as my name has been mentioned I will endeavour to make a few remarks. With a view to bearing out the statements which Mr. Lacy Good has made, I should like to say that in Natal there is ample evidence of the assistance which civil engineers may render in the time of war. It is, perhaps, not generally known, although it is to most military men, I believe, that during the South African War the whole railway system in Natal was managed and worked by the Government railway staff. When I say was "worked" by them, I mean, of course, that they took their instructions from the officers commanding the forces there, but the execution of the details was left to them. The destruction of railway bridges in the course of the war was enormous, considering the length of the railway, and the repairs of those bridges were left in the hands of the railway staff. Every bridge between Mooi River and considerably north of Ladysmith was destroyed by the Boers, and I believe it was General Buller himself who applied to the Natal Government to appoint one of their engineers to take charge of the reconstruction. My brother (Mr. A. J. Humby, M.I.C.E.) was selected to carry out those works, and he was nominally under the direction of the officer commanding Royal Engineers; but all the executive work was done by him and his staff. Many of the bridges were entirely reconstructed. The Tugela Bridge has been singled out for mention, because perhaps that is an engineering feat, both from a civil engineer's point of view and also from a military point of view. That bridge was 660 feet long, 32 feet high above the bed of the river, constructed of 14-inch square timbers, and was built partly whilst the river was in flood. The timber was brought up from Durban, where there was a large stock in hand previous to the war, designated for use in the mines. That timber

was made use of, and the whole bridge was constructed within three weeks. I think those gentlemen who have seen that bridge will bear me out that it was a wonderful piece of engineering to carry out such an enormous structure of framed timbers, not merely lashed together as spars might be, but bolted together. It is also important to bear in mind that the bridge was erected whilst the men were being daily sniped at from the northern side of the Tugela. It was ready for the Princess Christian's ambulance train to cross the day after the troops got into Ladysmith. The emplacements for the batteries at Chieveley and other hills on the south side of the Tugela were, with one or two exceptions, all carried out by the railway staff. Not only were the emplacements prepared, but each one was connected with the main line, so that ammunition and provisions for the troops were brought up almost as soon as the guns were in place. I merely mention these facts to point out how ready civil engineers are—at any rate, British civil engineers—to assist their brothers in arms, and I am perfectly certain that should any war break out, the Army will always get the most patriotic help from civil engineers. The Natal railway engineers have carried out several other works during the South African War, and I should like also to mention work which they did long before that, viz., in the first Zulu War of 1879. At that time the railway only extended to half-way between Durban and Maritzburg. The Zulus were expected down almost every night; there was only a very small number of troops in the country at the time, so that they could render no assistance to the Colonial population. The Government therefore asked the Railway Department if they could assist, and they readily came to their aid and built a number of laagers, composed of rails and sleepers, which luckily were not required, but would no doubt have been extremely useful if necessity had arisen.

Mr. Henry Thwaites (Mem. Inst. C.E.):—I do not know that I have anything very particular to say on the subject of the author's paper, because I left South Africa very soon after the war commenced; but I should like to add, in reference to the Table Bay Harbour Works, of which I was chief resident engineer for more than twenty years, that I think I was of considerable help, both to the military and naval authorities, in suggesting means of defence for that port. There were several occasions on which I was consulted in regard to that matter. I may remark that probably civil engineers, knowing the configuration of the ground and all the details of the country in which they are carrying out works, may be able to prove themselves of great assistance in time of war. As I was not present during the principal part of the South African campaign, I cannot personally say what help was afforded to the military authorities by the civil engineers; but from all sources I have heard that they rendered most efficient service during that period. I may add that owing to the exceptional advantages possessed by the Table Bay Harbour Works in the shape of special labour such as electricians, divers, skilled workmen, sailors, etc., with the necessary machinery and appliances, a very valuable and efficient corps could be formed for the protection of the port, both by sea and land, and as a fact the local land forces were materially augmented, both as to officers and men, from these works.

Mr. H. P. B. Rigby (Mem. Inst. C.E.):—Like the last speaker, I scarcely expected to be called upon to say anything this afternoon. I received an invitation to attend this meeting, and it has given me the greatest possible pleasure to hear the paper which has been read by

Mr. Lacy Good. Like himself, I had something to do in connection with the late war as an ordinary civil engineer, and I was called upon in many instances to assist both in carrying out works and in giving advice to the local military authorities in Cape Town. With regard to the question of organisation, which one of the speakers has said is a very important part of the duties of the military authorities, I found that the detailed organisation in many cases was not always perfect. No doubt, looked at from a military point of view, there are things which should be dealt with in detail which ordinary civilian engineers have no knowledge of. At the same time, I found in many instances it was very difficult to carry out works in a satisfactory and economical manner through the civil engineer not being sufficiently allowed behind the scenes. Of course, as a civilian I fully recognise there are matters which must be kept within the purview of the military authorities only, but there are certain details which can be carried out very much better by a civil engineer who is outside the military staff if he has more definite knowledge of what the intentions are. It is only by foreseeing the requirements of the future, and by giving engineers a certain knowledge of military matters which will make them competent to act at the necessary time in a most efficient way, that things will be properly carried out. I would submit as a proposition that if the military authorities were to make a suggestion to some of our engineering bodies, such as the Institution of Civil Engineers, that they should introduce into the curriculum or the teaching of ordinary civil engineers a certain amount of knowledge regarding military engineering, it would be a step in the right direction. Would it not be wise to suggest, in connection with the examinations which have to be passed before an ordinary civil engineer can be raised to the position of an Associate Member of the Institution, that questions regarding military engineering should be put to the students? This would necessitate the engineer during his training giving a certain amount of attention to military matters and military engineering especially. After the engineer had had a certain amount of practical experience he would be in a position, when war did occur, to render much better assistance than he would without that knowledge. The bringing closer together of military engineers and civil engineers is most desirable. When I say civil engineers I use the words with a certain amount of caution, because nowadays, outside certain spheres, any man may call himself a civil engineer; if he only rounds a broom in the street he calls himself a civil engineer, and therefore a certain line must be drawn. When a man has attained a particular status, either by experience or by passing certain examinations, then to my mind he should be admitted to a certain knowledge of military matters which will enable him to be of the best use and service to his country. My experience in South Africa showed that every engineer who was worthy of the name gave the whole of his attention, and submerged his own duties in trying to be of service to his country; but in many cases he was handicapped very considerably by the apparent overawing knowledge of the military engineer. The heads of the Royal Engineers were men who always commanded the greatest respect, but that was not the case with the junior officers; and the fact that that was so, tended to create discord, and wherever discord comes about in a camp, things do not move satisfactorily. The paper seems to me to be a good introductory to a better understanding being brought about between civil engineers and military engineers; and there is no doubt that, by constant communication between the two, future arrangements can be made which will be of the greatest service to the country.

Mr. G. Lacy Good, in reply, said:—I was very much interested in what Colonel Mayne and Colonel Scott Moncrieff mentioned in the course of their remarks. I quite agree with what they said as to the propriety of a study, on the part of civil engineers, of military tactics, in order that the value of their assistance in the design and construction of defensive works might be enhanced. Of course, it is necessary for civil engineers to act in subordination to the military authorities; but, as Mr. Rigby pointed out, it was a little galling in the late war to men of his and my age and standing to receive instructions from young fellows half our age. But no doubt this difficulty would be got over in any future war. Naturally, we all looked up to the older officers, with their far greater experience on purely technical matters. I had hoped that Mr. Thwaites would have told us something about what might have been done by the diving staff on the Harbour Works. Naturally, the resident engineer of the Harbour Works knows every sounding in the channel, and the divers also; and for laying mines or anything of that sort their services would have been most exceptional. I have not anything more to say, except to thank the audience for their kind reception of my paper. I omitted to hand round one photograph, which I have called "How we kept the colours flying at Klipplaat." There is a certain amount of interest attaching to the flags there, because they were made by a lady in Johannesburg, who was so patriotic and determined her child should be born under the British flag that she had the Union Jack spread over her bed!

The Chairman (Brigadier-General R. M. Ruck, R.E.):—I regret very much that there is not a larger attendance here to-day, but as regards the officers of the Royal Engineers there is a rival attraction. A lecture is being given this afternoon at Chatham by Major Sir Alexander Bannerman, R.E., upon the siege of Port Arthur, and as he was there throughout the whole of the siege, I have no doubt it has attracted a large number of engineer officers who would otherwise have been with us. Before making any general remarks on the subject of the lecture, I should like to read a letter which I have received from a very eminent civil engineer, Sir John Wolfe Barry. He says: "Dear General Ruck, I am sorry that I am engaged away from London on Thursday next, and so cannot be present at the lecture on the work of civil engineers in time of war. I have, as you know, taken some interest in the idea of securing for the country the assistance which civil engineers could render in time of war, and have, at the request of the War Office, laid my views on the subject before them. In the junior branches of the civil engineering profession there exists an important potential reserve which could be called upon in case of necessity, and I think that many young civil engineers would be ready to volunteer for such a reserve, and be willing to give some of their time towards qualifying themselves for their duties, provided they had some recognised position, and that their duties while in the reserve would not conflict with their civil work. The training of young engineers as resident engineers and assistant engineers of their seniors in the profession or on the staff of railway companies or contractors fits them thoroughly to execute many military engineering works, but still more importantly their education makes them acquainted with the management and control of large bodies of workmen of all classes. It also makes them well acquainted with the use of machinery and the organisation of transport. From all points of view I welcome a more intimate association between the Royal Engineers and the civil engineers for the above purposes, and I think a good scheme could be evolved on which such an association could be based. If I had been able to be present at the

lecture I should have been very glad to have personally laid my views before the audience." I do not propose to detain you by remarks as to the detailed works described in the lecture. I would only say that we have listened with the greatest pleasure to the experiences of Mr. Good and the other gentlemen he has referred to how they adapted their knowledge of engineering matters to the defence of their country. Mr. Good alluded to some very valuable assistance rendered by the civil employés of the railway companies during the war; and on this subject, an officer who had served during that war has sent me a few notes, which, I think, may be of interest to you. He says: "In that war perhaps the chief example of the many cases where civil engineers gave their professional services to the country as military engineers, and did not only serve in a purely combatant capacity, was that of the late Major L. I. Seymour. This gentleman, one of the leading mechanical engineers employed in the gold mining industry of the Witwatersrand, originated the idea of organising the large amount of engineering and technical talent lying idle at the beginning of the war (owing to the occupation of the Rand by the enemy) so that it might be of some use to the British forces. The result of his exertions was the formation, in December, 1899, of an Irregular engineering corps of volunteers, called the Railway Pioneer Regiment. This corps, 1,050 strong, was, with the exception of a nucleus of Regular officers and non-commissioned officers, officered entirely by civil engineers and mine managers from the Rand who had engineering or technical knowledge. It did most valuable work in carrying out the heavy and semi-permanent repairs to the railways. In the ranks of the regiment were men of every trade and technical qualification. Major Seymour gave his life to this country, being killed in action on the 14th June, 1900, at Zand River, Orange River Colony, on which day another civil engineer was also killed, Lieutenant J. Clemens, of the same regiment. Another well-known case was that of Mr. Labram, the civil engineer who constructed a gun during the siege of Kimberley. He also was killed. I only quote these cases as some of a large number of instances of a similar character." It appears to me from what we have heard to-day, and from general experience, that very valuable assistance can be offered to military engineers by their civil confréres; but I think the essence of the remarks that have been made here points to the fact that this assistance should be organised in time of peace. This organisation may be considered under two main requirements. The first I should call a reserve of the Royal Engineer officers. The Royal Engineer officers are very few in number, really extremely few considering the variety and extent of the duties they have to carry out. Practically the establishment is now fixed that there is not a single engineer officer who is not absolutely essential in time of war; and behind them there is practically no reserve. We have a few retired officers, but of course officers do not retire when they are quite young, so that very few of them would be available for war. What most of us would like to see very much indeed is a good reserve of Royal Engineer officers. A scheme has been mooted, to which Sir John Wolfe Barry has referred, and we have to a certain extent progressed with it, because we have approached that great institution which Mr. Rigby referred to, the Institution of Civil Engineers, and I believe that I may say that it has been favourably received. The general outline of such a scheme would be that a certain number of young engineers, during their more or less pupilage stage, should receive a really good military education, and join what would be called the R.E. Reserve of Officers, very much the same as the Royal Naval Reserve of Officers is

to the Navy, and that periodically they should go out for training with some of the field companies or fortress companies, whichever might be most suitable for them. I think that such an organisation might get over some of the difficulties that have been raised. Thus, when civil engineers are employed for defence works, everybody will, I think, agree from the discussion we have had to-day it is essential that they should have a considerable amount of military knowledge, which they would gain in the way I have mentioned. In addition to that, we have to consider the engineering work which has to be done on lines of communications, which Colonel Mayne alluded to more especially. As our Secretary of State for War (Mr. Haldane) said a few weeks ago, there is an enormous amount of work on the lines of communication—almost more than at the front. It is a well-known saying that the Army marches on its stomach, and the stomach is the line of communication. Therefore, it is an extremely important work. That work, as you know, consists largely of railway work, telegraph work, road making, hut building, and works of construction generally. I was very much impressed indeed in reading the accounts of the Japanese War, with the enormous numbers of men they employed on engineering work on the lines of communication. In the actual constructional work, that is, the building of cantonments, huts, and so on, literally thousands of men were employed. That description of work is work that a civil engineer is accustomed to from his earliest boyhood, and he does a great deal of it all through his life. Hence he would be able to do that kind of work without any special preparation. At the same time, it would be advisable, and in some cases essential, that he should have a certain knowledge of military training, military conditions, and military customs generally, and that, I think, can be obtained most readily in our auxiliary force organisations. We have, I am glad to say, a most efficient body of Engineer Militia and Volunteers, which, I think, could be modified and expanded as required. They could undertake the greater part of this kind of work, leaving the Royal Engineer to his more purely military duties. There are certain cases also—it may be either in the actual field of battle or on the lines of communication—when long, extensive lines of defence have to be made. We have all heard of Wellington's lines, and of the long lines of defence works which were put up in the late war. The execution of those works is sometimes carried out by soldiers and sometimes by civilians. Near the field of battle you may have to rely on the soldier to do this duty, but it very often happens that the works are executed in positions away from the actual battle-field, and then it is usual to employ thousands of civilians. There, again, I think you could get valuable assistance from civil engineers, associated with a certain number of military engineers. I think both Colonel Mayne and Colonel Scott Moncrieff alluded to the fact that the best military engineers are those who have had most experience of large civil works; and I think it is largely due to the fact, referred to by Sir John Wolfe Barry, that they understand and have an intimate knowledge of the employment of large gangs of workmen. Therefore, in the execution of these large defence works, civil engineers should be specially useful. Before concluding my remarks I should like to allude to the great assistance which civil engineers have already given military engineers in enabling them to prepare for war. For instance, all the young officers at Chatham have to visit certain civil engineering works, and we have always had the greatest possible assistance from the civil engineers engaged on these works, who help us in every possible way. We have also received very valuable assistance from the

large railway companies in the instruction of our officers. We have a system of sending officers for a year on to these lines of railways, and the railway companies take our young officers and acquaint them with all the knowledge they require to make them good railway engineers. Not only do the railway companies extend that privilege to us, but a certain number of private engineering firms and also the Admiralty give our officers similar facilities for instruction in other branches of engineering. I am sure that the Royal Engineers here and everywhere else would like me to say how very much we wish to reciprocate this assistance which we receive from civil engineers, and to add that we also are very proud of belonging to the great profession of engineering. I have now, on behalf of all present, to thank Mr. Lacy Good for the lecture he has so kindly given us, and which, to my mind, is of especial interest in its larger aspect. I should also like, on behalf of those Royal Engineer officers who served in South Africa, to take advantage of this opportunity of thanking those civil engineers who served in that war, and who assisted us in the most cordial and devoted manner, some of them, as has been mentioned before, even to the death.

# THE TACTICAL EMPLOYMENT OF MACHINE GUNS WITH INFANTRY IN ATTACK AND DEFENCE.

*By Captain F. TAKENOUCHI.*

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## GENERAL REMARKS.

THE machine gun is quite a recent development, and its employment in the field is only in its initial stages. In the late war it was not until after the battle of the Sha-Ho that it was used with infantry in the field, and our experience of its use is confined to the actions of Hei-kou-tai and Mukden. The majority of officers have not, therefore, had an opportunity of studying the characteristics or use of machine guns, and it is consequently too early to model rules for their employment. However, it is hoped that the following may go a little way to assist in the study of this subject.

*Mounting, Tripod or Travelling Carriage (2 Wheels).*—The usual mountings used with infantry are the tripod and the 2-wheeled carriage mounting; the former being either carried on pack animals or on a carriage.

The movement of the carriage mounting (we include in this regard the tripod mounting on a carriage) is open to grave objections from the tactical point of view. It has diminished mobility, and when operating with infantry, may, thereby, not be available when required; at night the noise of the wheels gives away its presence to the enemy; also, when close to the enemy, the presence of the wheeled carriage in the skirmishing line is practically an impossibility. The machine guns for use with infantry must, therefore, be the tripod pattern, carried on pack animals outside the field of fire, and man-handled when tactical considerations indicate that course; this renders the gun avaliable in any situation.

The following are the most striking characteristics of machine gun fire and its capabilities:—

1. The development of a heavy infantry fire for short intervals of time.
2. In a narrow space, the production of a concentrated cone of fire on a single spot.
3. In position it can, over a narrow front, produce the same effect as a large number of rifles. It is not suited to the holding attack.

*Concentration and Dispersion (in Attack or Defence).*—The result of employing a number of machine guns together is not by any means necessarily the sum of their several values. For instance, over a narrow front there is little difference as regards time or fire effect, whether we employ 2 or 6 guns. Moreover, the amount of ammunition used in a short space of time is so great that unless it is used with economy the result will not counterbalance the means. Also, the sources of ammunition supply in the neighbourhood, the brigade reserves, and ammunition columns, will speedily run out of ammunition if called on to supply a number of machine guns.

Except when a broad front has to be covered by machine gun fire (as, when employed to protect a space between 2 forts, widely separated), massing of guns is a principle to be avoided.

While the distribution of one gun to each locality is admissible, both from the theoretical and fire effect points of view, and the unit for machine guns might be considered as one gun, yet, the present imperfect state of the gun's mechanical development, the occurrence of jams in a complicated mechanism, and the liability of being put out of action by the enemy's fire, necessitate two guns as the minimum for the machine unit.

## Attack.

*Collision when both Sides are in Motion.*—The normal procedure in this class of action is, that the advanced guard will immediately seize and firmly hold a position in order to give the main body time to deploy. In this case, where sudden and not necessarily prolonged action is required, the rapidity of movement and fire effect possessed by the machine gun render it especially suitable. After the first

deployment, however, when the duty of the advanced guard is to hold the enemy, machine gun fire is no longer suitable. For the commander to use the gun as a substitute for infantry fire shows ignorance of its nature; he must thoroughly realise the characteristics of the weapon and the consumption of ammunition its use entails, and bring it into action for only brief periods, as, in repelling an attack of hostile infantry. I will now consider whether the commander of the force should attach all or only a part of his machine guns to the advanced guard. The main arguments are the same as in the case of the distribution of the field artillery. The chief rôle of the advance guard is to fight a delaying or holding action, and there is no necessity for the presence there of a large number of machine guns; while on the other the commander will certainly require machine guns in the direction of the decisive fight. Consequently, a portion should be attached to the advanced guard, but the greater number to the main body. For instance, with 6 guns 2 should be attached to the advanced guard, and the remainder to the main body.

*Position Operations.*—In the attack of a prepared position the question whether machine guns should accompany the first line from the commencement, or be held in reserve under the disposal of the commander of the force, is a much vexed question. I will attempt to solve the question in the light of practical experience.

A personal experience from the battle of Mukden illustrates the employment of machine guns in the first line.

During the fighting on the 1st of March, the machine gun detachment of a certain division was opposed to an enemy in a strongly entrenched and loopholed Chinese enclosure, from which they were delivering a heavy fire. When our guns turned on "continuous fire," the enemy's musketry immediately subsided to commence again when our guns temporarily ceased firing. A second burst of fire, while not inflicting much material loss on the enemy, affected his *morale* and compelled him to take shelter behind the parapet. At the same time it greatly increased the spirit of our attacking forces, and had all the effect of important reinforcements, so that they were able, with a rush, to get close up to the enemy.

Second example (from the report of a certain regiment's machine gun detachment commander).

On the 2nd of March, in the attack by a certain detachment on a redoubt on the north side of a certain village, the machine gun detachment of a certain regiment was on the extreme right wing of the first line. When the first line of our infantry left their trenches near the northern end of the village, to advance to the attack, our machine guns, in order to cover the advance, turned a hot fire on the redoubt and temporarily silenced the enemy's rifle fire. On account, however, of the enemy's machine gun, which was under cover, and an enfilade fire from another direction, our infantry was compelled to suspend their advance; for this reason our machine gun ceased firing, as all it could effect was to prevent the enemy in the fort putting up their heads.

Third example:—In the attack on a certain position on the 24th February, under cover of machine gun fire from positions on the high ground on the front and flanks, an assault from three sides enabled us to carry the enemy's position at 3 p.m. The success of the attack was chiefly due to the fire of our machine guns, which prevented the enemy from raising their heads above the trenches.

I draw the following deductions from the above examples:—Machine guns in the first line, while assisting the advance of the attacking infantry, do not inflict any material loss on the enemy, merely keeping him below the crest of the parapet. Whether the rôle of the machine gun was properly understood on the above occasions I consider is a matter for speculation. The attacks on positions in the recent war occupied a great deal of time, and, to judge by this experience, the attacks of the future will be very prolonged. If the attacking infantry are going to rely on the support of the machine gun, on account of the expenditure of ammunition, this support must be confined to the decisive action. Even then the valuable ammunition which is expended does not inflict any actual loss on the enemy, but only keeps his head down; hence, the results obtained are of a negative nature, one might almost say *nil*. That the attack of a fortified position is a matter of great difficulty, and requires a covering fire, goes without saying, but in my opinion this is, as a rule, best performed by field, or heavy artillery, shrapnel fire, and if there is proper co-operation between the infantry and artillery, the former, seizing a moment when the position is enveloped in shell fire, should be able to prosecute the advance. While not altogether vetoing the employment of machine guns for covering fire, I only condemn their substitution for artillery at long ranges. The infantry drill book says that the most suitable moment for rapid fire is the final preparation immediately before the assault, when the attacker should develop his highest intensity of fire.

When, however, on account of the proximity of the two forces, the artillery are obliged to cease fire, and the defenders, regardless of loss, must rise in their trenches to fire at the assaulting columns, then is the moment when machine gun fire is no longer wasted in the air, but may inflict material loss on the enemy and substantially assist in making the assault successful.

The conclusion to be drawn from the above is, then, that the employment of machine guns in the first line from the commencement of the deployment, for the purpose of giving covering fire to the attacking infantry, is inadvisable; that machine guns should be held at the disposal of the chief commander as a handy reserve, either to meet a change of situation, or to assist a threatened point, or to threaten the enemy's flank, or to meet a cavalry charge; and that not until the final moment of the final attack should they be used with their full power in the first line.

If the point for assault lies within effective fire from the flanks, or from commanding ground where machine guns can be posted from the commencement (to open fire not before the moment of the final attack), the advance can be assisted most effectually.

The third example given above, a condition which frequently occurs, illustrates this. In this attack machine guns were first posted in positions *a* and *b*. The machine gun at *a* being too distant from the point for attack, subsequently moved to *c*, and when the final attack took place, a deadly fire was concentrated on the position *A* from *b* and *c* with great effect.

*After the Successful Attack.*—On this occasion the commander must not forget to make use of the mobile qualities of the machine gun. The Infantry Drill says:—"The mere capture of the position does not suffice; its possession must be secured. To do this the retreating enemy must be pursued and measures taken for the security

of the position." For these duties the machine gun is especially suitable. The infantry, suffering from the heavy losses usually attending the capture of a strong position, will be somewhat disorganised, and the artillery will take some time before they have changed their position and are able to fire in the pursuit. But the machine guns, which will be close to the position, having taken part in the final attack, can easily be man-handled on to the captured position. They can then assist in rendering it secure, prevent re-capture by the enemy, and pour a deadly and demoralising fire into his retreating columns and confirm the victory.

The following is an example from my own personal experience:—

At the battle near Mukden, on the 1st of March, at 8 p.m., the enemy's position at Sha-Shan, to the south-east of Li-chia-wo-pêng, was taken. The enemy in Li-chia-wo-pêng, about 500 yards from the captured position, then poured a heavy fire upon us; and, further, the enemy in Wang-chia-wo-pêng, about 1,000 yards to the west, were still offering a stout resistance to our detachment on the left, and also appeared to threaten our flank. On this occasion our machine gun department, attached to our right flank party, which had accompanied the assaulting column, advanced on to the position. Making use of the enemy's sandbags, a strong machine gun work was constructed, which completely secured the position for us. I am certain that any charge by the enemy would have been effectually repelled.

### 3. The Defence.

The nature of the machine gun makes it especially suitable as a weapon for the defence, painful proof of which has been frequently demonstrated to me in the attacks on the Russian positions.

*Machine Gun Positions.*—The positions in a defensive position, where a machine gun can be most suitably employed, are as follows:—

1. Positions where their fire can be developed against the enemy's probable line of attack.
2. In an offensive defence, in sections in the area of passive defence, thereby enabling a reduction to be made in their garrison.
3. In weak or important points of a position, where, from the nature of the ground a large number of rifles cannot be brought to bear.
4. Against points where the enemy, to advance, must occupy a narrow front.
5. To flank dead ground in front of a position.
6. To bring fire to bear on the area between two forts, or for the flank defence of forts.

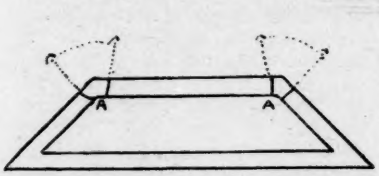
As will be seen from the above the conditions most suitable for the development of machine gun fire are a narrow area, and a definite target, upon which a dense cone of fire can be concentrated. While we expect it to be useful in covering a wide area, it is not intended that the enemy should be swept with fire at long range, but, that a fire can be directed on an enemy appearing at any point in that area.

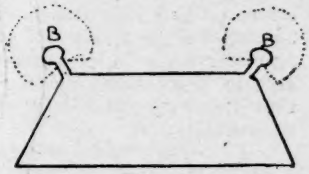
In the defence of a broad front, where few guns are available, machine gun positions should be constructed in salients or re-entrants

in the position, the extent of front before which should be as wide as possible within the limits of effective fire.

In the case, however, of a perfectly straight front, which possesses no salients or re-entrants, it is often expedient to construct a salient position for machine guns, without, if possible, presenting a target to the enemy's artillery. Alternative positions may also be constructed at intervals.

Where field works have been constructed in certain important points of a position, from which a sufficiently broad field of fire for machine guns is not obtainable, they may be advantageously pushed forward in front of the work in the salient angle, as shown in the diagrams below. (Types used by the 3rd and 5th Divisions towards the end of the late war.)




*Principles of Distribution.*—Whether machine guns should be distributed to sections of the defence from the commencement, or whether they should be held in reserve at the disposal of the commander, depends on the ground, situation, number of rifles, etc., and cannot be fixed.

The occasions when they should be distribtued from the commencement are chiefly as follows:—

1. In positions of single importance, where there will be no likelihood of a change of position.
2. At points, development of fire from which affect the whole front of the position.
3. Where considerations of ground render the operation difficult, to cover the occupation of the pre-arranged position by the reserves, or when, with respect to the situation, the proper moment for their arrival is likely to be delayed.
4. When a large number of machine guns are available, and a portion can be allotted to the important points of the first line from the commencement, the main portion being held in reserve.

To anticipate the changes of battle phase is a matter of difficulty, especially in the case of the defender whose rôle is a passive one. For this reason the machine guns should be placed in the first line at the commencement as sparingly as possible. Their mobility renders them a handy reserve in the hands of the commander, to fill a deficiency, to assist threatened points, to stop turning movements, to repel attacks, to aid in the counterstroke, etc.

With a small number of machine guns, the more extensive the front, the more necessary does their retention in reserve become. After the battle of Mukden, a certain division was detailed for the garrison of Chang-tu. The position encircled Chang-tu on three

sides, and was several miles in extent. There were over nine positions for machine guns (being three times the number of machine guns available). In a case as the above, everyone will agree that there would be no advantage in fixing the machine guns in one position from the commencement, yet, on the close approach of the enemy, and when an attack may be expected at any moment, whether the position be extended or restricted, there must be no hesitation in placing the machine guns in the most important point in proper time. After the battle near Hei-kou-tai, the force detailed for the garrison of Yao-tzu-pao was opposed to an enemy near Wang-chia-wo-pêng. Our defences practically surrounded the village, and the machine guns, which were all massed at the most important point, were a most powerful asset in the preparations. On the night of the 3rd February, about a brigade of the enemy's infantry made a fierce attack on this position, but the stubborn resistance of the garrison, assisted by the heavy fire of the machine guns, were successful in repulsing his superior numbers. This, where the machine guns were able to immediately develop their fire at night, is due to the fact that they were placed in position in the defences from the commencement.

*Epaulements and Alternative Positions.*—The machine gun has most to fear from shell fire. Its position should, therefore, be well concealed, and, as far as the situation will permit, a strong epaulement should be constructed, for, however well the position be concealed, once fire has been opened the machine gun becomes the target for the enemy's artillery, and will be most probably put out of action. To avoid this danger, alternative positions should be constructed in advance, and allowance made for sudden changes of position. (In the battle near Mukden, on the 1st of March, a certain mountain battery, whose objective was the enemy's machine guns in Wang-chia-wo-pêng, advanced to the corner of the village of Yao-tzu-pao, and were partly successful in their object.)

*Opening Fire and Selection of the Target.*—In the defence these points require special attention. To open fire on a thin line of skirmishers at long range is a most useless proceeding, and gives no return for the ammunition expended. On the other hand, fire at close range at skirmishers advancing to the assault, or at bodies in mass, gives overwhelming results in a short time. The Russian Army repeatedly gave me lessons in this regard. I will put down a few instances:—

*1st Instance (of Improper Use).*

At the battle near Hei-kou-tai, on the 27th of January (in which I took part as a company commander), when attacking an enemy near Sha-shan, far on the left flank of the army, about four of the enemy's machine guns, at a range of about 1,000 yards, swept our widely extended skirmishing line with fire. It had no effect whatever on our advance, and the enemy eventually evacuated the position.

*2nd Instance (Proper Use).*

At the battle near Mukden, on the 1st March, the left of one of our divisions was attacking the enemy near Wang-chia-wo-pêng. When our attacking infantry were about 200 to 300 yards from

the enemy's position, and a portion were about to make the assault, the enemy suddenly opened a heavy machine gun fire from cleverly-concealed positions, causing us such heavy loss that the attack was temporarily suspended.

These practical examples prove what has been stated, that the power of this weapon must not be over-estimated; that, in the defence the enemy cannot be stopped at a distance in excess of the effective range of the rifle; and that any statements to the contrary show an ignorance of the economical use of the machine gun.

*Retreat.*—The machine gun will only be used on special occasions in the retreat:—To temporarily drive back the enemy, or, in rear of a defile, to hold up the enemy's pursuit, etc. But as the object of a rear-guard, or force covering a retreat, is to keep the enemy at long range, so the machine gun, whose characteristics fit it for short action at close range, is unsuited for employment in a retreat.

## Conclusion.

It is a mistake to suppose that the machine gun will influence modern tactics, or that it will take the place of the gun or the rifle. It can do no more than supplement gun and rifle fire during certain phases of the fight. The tendency of public opinion to exaggerate the power of the weapon must be strongly guarded against.

Further, the idea that the rattle of discharge of the machine guns will, as they come into general use, be a continuing factor in producing moral effect, is equally to be combatted. History provides a parallel instance, when, our Kamakura warriors met a few smooth-bore muskets for the first time; but the terror of the first introduction soon wore off.

The tactical use of the machine gun, and the value to be obtained from it, depend on an accurate estimation of the effect produced taken into consideration with the amount of ammunition required to produce that effect.

# THE MILITARY RE-ORGANISATION OF CHINA.

Translated by permission of the French Minister of War from the *Revue Militaire des Armées Etrangères.*

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Continued from March JOURNAL, p. 341.

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## THE RECRUITING OF THE NEW CHINESE ARMY.

As we have seen in the previous chapter, the National Chinese Army is to comprise:—

The Active Army, or *Tchang-pei-kiun*;
The First Reserve, or *Su-pei-kiun*;
The Second Reserve, or *Hô-pei-kiun.*

These troops are quite distinct from the Police or Gendarmerie forces (*Sun-djin*), organised on Japanese lines and charged with the duty of maintaining order in the country and repressing brigandage.

All the old troops are destined to disappear; they no longer receive any young soldiers; while waiting their complete extinction they are employed in police work.

The new army is to comprise in principle only men who voluntarily engage, belonging to the good elements among the people, and known personally to the local Mandarins.

*Length of Service.*—Every soldier is to serve for ten years, as follows:—

Three years in the Active Army;
Three years in the First Reserve;
Four years in the Second Reserve.

*Conditions required for Recruits.—Age*: To be over twenty but under twenty-five.

*Physique*: A minimum height of 4 feet 8 inches in the Northern Provinces; of 4 feet 6 inches in the Southern Provinces.

To be neither myopic nor deaf; to have no infirmity and to be able to lift a weight of 60 kg. (132 lbs.).

*Moral*: To be handy; not to be an opium smoker; to have no secret vices, and to have never been mixed up with revolutionary matters.

*References*: To belong to a known family and to be able to furnish, when joining, the names of his forbears up to the third generation.

*Instruction*: To be acquainted with a certain number of characters.[1]

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[1] The Chinese do not use an alphabet but characters, of which there are over thirty-thousand in the language.

*Recruiting Operations.*—Service is not obligatory, save for the Manchus, who alone are under compulsion to serve, although, practically, a very small number among them are employed in the new forces.

The 36 mixed divisions of the future Chinese Army will simply require, with the three years' service, an annual contingent of 140,000 men, that is in taking the population of the 18 provinces at 300 millions, about one-tenth of the young Chinese of 21 years of age.

In case of there being a lack of candidates, the Recruiting Department fixes the number of soldiers to be furnished, and the Notables must make the necessary arrangements for supplying them.

The recruits are presented to the recruiting officers by the head of the District, who is responsible for good men being chosen.

After examination, the recruiting officers send the list of those fit for service to the head of the District, who makes out the matriculation register.

After being accepted, the recruits receive a small rate of pay daily; when they leave to join they are allowed travelling expenses, which cover their subsistence on the journey.

A certificate of enrolment is sent to the parents.

*Regional Recruiting.*—The recruiting will be, as far as possible, *regional*, or rather *provincial*. Some instructions recently addressed to the Yangtse Provinces, and Kiang-su in particular, are even, on this point, more formal than the general Regulations. The only provinces, which will have to maintain large effectives, Chi-Li and Hu-peh, would be able, as an exception, to have recourse to the regions well supplied with good men, such as Shantung, Honan, Hunan, etc., but will have to draw in those circumstances on the most accessible districts or those traversed by railways.

*Pecuniary Advantages.*—The gross pay of the soldier is 4½ taëls a month.[1]

One taël is deducted each month; the money retained is sent every six months to the local Mandarins and transferred by them to the parents of the soldiers in exchange for a receipt; a note of this payment is made on the certificate of enrolment.

Families, who may have to complain of delay or diminution in the amount of the payments, can address a protest through their son to the Commander of the Corps.

Three months after joining, the recruits undergo an examination; the parents of those who pass satisfactorily and possessors of less than 30 *mou* (about 5 acres), will be exempted from the land tax. Other advantages can also be granted them.

*Embodiment and Promotion.*—The recruits destined to fill the vacancies in an existing unit join at the same time.

For the newly-created units, the following is the procedure:—

One-fifth of the recruits is first embodied; after five months of instruction the best among these men are nominated corporals or soldiers of the first class; the remaining recruits are then called out and instructed by these men. After three months of instruction

[1] A taël is worth about 3 shillings.

the best of the instructors are promoted to non-commissioned officers; the others to corporals or soldiers of the first class. The best of the recruits pass to soldiers of the second class, and, five months later, can be advanced to the first class. In the course of the following years these soldiers can be promoted to corporals and non-commissioned officers.

Their training should be complete in ten months.

The promotion of the soldiers is regulated by the commandant of the battalion or group, and the commander of the company, squadron, or battery.

*First Reserve.*—After three years of service in the *Tchang-pei-kiun*, the soldiers receive a certificate and return to their homes in the quality of reservists (*Su-pei-ping*). They remain thus for three years, and receive during this time one tael a month.

They can work freely at their professions.

*Reserve Districts.*—Every centre possessing more than 100 reservists forms a District of Reserve, administered by a non-commissioned officer. If the effective is larger, two or more non-commissioned officers will be nominated, and, if necessary, an officer.

The centres counting less than 100 reservists will be attached to a district or be grouped two and two under the charge of a non-commissioned officer.

In each Prefecture the reservists will be grouped in numbered companies.

The officers and non-commissioned officers employed in the Reserve Districts are charged with the duty of paying the men monthly in the presence of the local Mandarins, and every six months of paying amounts forwarded from the men actively serving to their families; further, of forwarding to their families letters of sons serving with the colours; and lastly, of preparing for the enrolment of the recruits.

They keep the matriculation register of the soldiers and reservists in their districts.

*Periods of Instruction.*—The tenth month of each year the reservists go through, at the seat of their Prefecture, a period of one month's instruction, during which they receive the pay of the *Tchang-pei-kiun*.

They are conducted to the Prefecture by the non-commissioned officer of the district, and are clothed and armed from the mobilisation stores. After the completion of their period of instruction the arms and clothing are returned into store.

The reservists are inspected during this course by an officer specially delegated for this duty.

No reservist can absent himself from his district without permission.

Every reservist residing in a district, other than that in which he was born can put in his period of annual instruction there, provided he sends in a request before the end of the sixth month; the head of the recruiting district informs the Viceroy or the Governor interested and gives the answer to the request in the course of the eighth month.

In case of sickness or important business he can be granted a delay after enquiry.

In case of war, every reservist is to present himself at the headquarters of his place of residence or domicile *under penalty of death*. It is there that they will be clothed, equipped, armed, and despatched from.

*Second Reserve.*—After three years of service in the *Su-pei-kiun*, the reservists receive a second certificate and pass into the 2nd Reserve, where they are paid at the rate of half-a-taël per month. They will remain there four years.

Every centre counting 200 reservists of the 2nd ban will form a 2nd Reserve District. If the number is below 200, the reservists will be attached to a district of the 1st Reserve.

The reservists of the 2nd ban put in a period of drill during the tenth month of the second and fourth years of their stay in the 2nd Reserve

*Completion of Service.*—After four years passed in the 2nd Reserve, the reservists receive a certificate of discharge from the Service.

In case of war, those under 45 years of age, who wish to rejoin the colours send in a request to the Chief of the Reserve District and produce their certificate of discharge.

At the expiration of the ten years of military service, the best of the non-commissioned officers can receive employment in the recruiting service. After a special examination a similar advantage may be granted to energetic and healthy privates.

The most severe penalties are levelled against desertion. The Chief Notables and Mandarins are held directly responsible, and suffer penalties proportioned to the length of time of desertion.

*The Actual Situation.*—At the present time there exists in China only 4,000 reservists of the new *régime*. They belong to the 1st Division of *Tchang-pei-kiun* of Chi-Li (at Yung-ping-fu), and have been discharged by *échelons* of a thousand during the months of March, April, May, and June, 1905. They were incorporated under the special regulations obtaining in Chi-Li, which have served as the base of the law of 1905, and become from that time obligatory through the whole Empire. The men of the trained troops, who have been sent to their homes in consequence of the weeding out and changes recently effected, are not considered as reservists. In case of war they will perhaps be recalled to the colours, but not in the units of the new Active Army.

*The Chinese Soldier.*—From the point of view of physique, the Chinese soldier is strong, muscular, well built, sober, smart, adroit, and an excellent marcher. He takes voluntarily to gymnastics.

His endurance may have, perhaps, some tendency to fall off, owing to the amelioration of his comforts in times of peace, difficult to be realised during war in a permanent fashion.

The new soldiers are, as a matter of fact, incontestably better treated than those of the old Army; they are housed in good barracks, have good beds and are well clothed. Better paid, also, they can improve their diet and eat meat. They are provided with good wadded and furred clothes for the winter, with light clothing for the summer, impervious to rain. They have also military doctors,

nurses, hospitals, stretcher-men, and ambulance carriages. The question may well be asked if, growing quickly accustomed to this increase of comfort, they will not be affected in greater numbers by the hardships to which in the ordinary way troops are exposed in time of war. We can state that in 1903, on the frontier of Tonquin, there were eight camps of *Tchang-pei-kiun*, brought from Hu-peh, clothed and equipped in European style, recruited with care and excellent troops, yet they left on the road a moiety of their effective, debilitated and decimated as they were by disease.

From the point of view of *moral*, the present type of the Chinese soldier is superior to the old. They are recruited only from the good elements of the population. This *moral*, already better, tends to rise still more in the future.

There exists, moreover, in the large towns, a serious current of patriotism and nationalism. It is a new development, which should be followed attentively.

There are two other points which are scarcely less important, viz., the evolution of the youths at the Universities in the direction of militarism, an evolution which shows itself to-day in the preparatory military instruction, obligatory in the Government schools, and the excitement caused by the victories gained by the Japanese over a first-class European Power.

Militarism in the youth of the country is encouraged by the Viceroys, Yuan-Chi-Kai and Chang-Chi-Tung, while the Court favours it by the Edicts enhancing the military career and giving the officers Mandarin rank. To-day, the pupils of all the schools directed by the Chinese or by the English and American Protestant Missionaries dress in uniform, and twice a week go very correctly through gymnastic exercises and manœuvres under the supervision of Japanese instructors or of officers of the Active Chinese Army; the Viceroys and Governors supply them with old rifles, review them, congratulate and reward them. With regard to the successes of Japan, they have broken a spell: the profound sentiment that the Chinese had of the impossibility of measuring themselves on the field of battle against Europeans with any chance of success.

The *moral* of the Chinese soldier can only be improved as yet by the obligatory instruction given in the barracks by the officers.

At the present time, every battalion and every group of cavalry or artillery has its regimental school, where non-commissioned officers and soldiers, after having learned in their daily drills the handling of modern arms, complete their general instruction. They are taught new characters; are given some idea of arithmetic, geography, history and hygiene; and in the *moral* theories, the sentiments of solidarity, honour, patriotism, and devotion to the Emperor are inculcated, which they are not taught in their families. Efforts are also made to give them a high idea of the military calling, and to elevate their spirits and their *moral* by soldier songs.

This regimental instruction gives the officers of the new school the opportunity of showing to the men that they are much superior to those of the old army; it helps in giving the soldiers the confidence in their leaders, which has always been wanting hitherto.

From what has gone before it is evident that the *moral* of the new Chinese soldier is improved and will improve still more, provided always that the work of military renaissance at the present time does not prove to be only an ephemeral excess of energy. It will be necessary before all that the men shall be paid regularly and in full, the Chinese soldier being only under the colours to exercise a remunerative rôle, which affords him provisionally a certain amount of credit, an opening and a small pension.

*Administration of the Reserves.*—In every district there is to be an officer in charge of the Reserves. At present there is no one for this duty. Choice will be made at first from among old lieutenants or adjutants, not in robust health.

For five officers of this kind (*Toui Kouan*), one *Kouan-taé* will be selected, who will centralise and make uniform the organisation.

The *toui Kouan* will reside in the *Tchéou* and the *Hieu* (Sub-Prefectures), and the *Kouan-taé* in the *Fou* (Prefectures) in order to carry out their work. They will centralise the pay and expenses of the service. A certain number, varying according to circumstances, of soldiers and coolies, will be attached to him.

In each district where there are more than 100 Reservists, there will be a *toui Kouan*; if there are more than 200, another officer will be added. If there are less than 100, small districts will be grouped into a single department. If this department is very extensive, a lieutenant or *toui Kouan* will be added.

In each *Fou*, the Reservists will be grouped in numbered companies (from 1 on).

The pay of the officers and soldiers of the Reserve will be forwarded by the Treasury the first of each month, in accordance with the lists made out by the *toui Kouan* and the local Mandarins. If a soldier is some distance off, or finds it impossible to come himself, he should give notice beforehand and authorise his parents to receive his pay for him.

The arms and clothing of the Reserve will be sent on demand from the central magazines to the local Mandarins, or *toui Kouan*.

If there are troubles in a district, or brigands, and if at this point the number of soldiers is insufficient, the local Mandarin will take measures with the *toui Kouan* to call out the necessary number of men from the Reserve. Each of these will be paid at the rate of a taël and a quarter per day.

At the time of recruiting the new soldiers, and the sending of money, the *toui Kouan* will aid the local Mandarin in the details of the service.

If a man of the Reserve does not give in his exact domiciles, the *toui Kouan* and the local Mandarin will inform the military bureau; search will be made and the offender will be punished as with deserters of the Active Army.

Every time that a graded reservist commits some fault, he will be stopped a taël out of his pay.

Each year, from the ninth to the tenth month, there will be a general assembly; if anyone is absent the *toui Kouan* will report him to the local Mandarin, who will punish him.

At the time of the assemblies for manœuvres, the soldiers will live under tents; the straw and fuel will be furnished according to the infantry Regulations. The coolies will be paid in advance.

*Duties of the Reservists at their Homes.*—Every reservist, who shall change his residence or wishes to remove from one place to another, must, during the preceding fortnight, inform the *toui Kouan*, who will acquaint the Authorities.

If the new residence is more than 500 kilometres (310 miles), and the reservist wishes to put in his period of drill where he happens to be, he must inform no later than the 6th month the *toui Kouan* of his place of birth, who will report to the *Ping-pei-tchou* (the Bureau of General Organisation and Recruiting), which will give the necessary permission. If in such a case there is no reserve district, the applicant must return to his birthplace.

During the month of the Annual Manœuvres, if a reservist is seriously ill or compelled to assist at a marriage or funeral, he must previously inform the *toui Kouan*, who in that case could give the necessary permission.

Every reservist who does not wish to serve further will be placed on the quarterly lists, which are kept at the Archives.

The reservists at their homes will be exempt from the *corvées*. The local Mandarin must keep an eye on and protect their families while the men are in camp.

Soldiers who have differences with the inhabitants of a place must submit them to the local Mandarin, who will enquire into them with the *toui Kouan*, and they will be settled in accordance with the law.

Every soldier who transgresses any military law will be punished in accordance with the rules of the service.

Every reservist who wishes to re-enter the service, must forward his request in conformity with the regulations laid down in such cases.

Every reservist who shall be guilty of a breach of the Common Law, will be tried in accordance with the laws of the Empire.

(*To be continued.*)

# THE BATTLE OFF TSU-SHIMA.

## IN MEMORY OF "THE SUVÓROFF."

## A PERPETUAL TRIBUTE TO FALLEN HEROES.

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Translated from the Russian of Commander Vladimir Semenoff, Imperial Russian Navy,

[With the Author's permission],

*By Lieut.-Colonel W. E. GOWAN, Retired List, Indian Army.*

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*Continued from March* JOURNAL, p. 326.

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### III.

"The game has begun!" thought I, as I went up on to the after bridge, whence could be seen not only the enemy's vessels, but also those of our own Squadron. As it was my duty to see and to describe everything, I considered this to be the most suitable place for so doing. In the same part of the vessel there now appeared Lieutenant Raidkin, the commander of the starboard stern turret, which was mounted with 6-inch guns. He had come there also "to look on," as it now seemed evident that the battle would begin on the port side, so that his turret would, for a time at any rate, be out of the sphere of action.

We stood exchanging some fragmentary remarks, wondering why the Japanese should have thought of crossing over to our port beam, when our weak spot—the transports and their covering cruisers—was a little abaft the starboard quarter. Perhaps they had reckoned that by accepting battle, whilst heading inversely, they might, by taking advantage of their superior speed, pass round our stern and fall at the same time on our transports and on our less powerful vessels in rear? But in carrying out this manœuvre they might easily bring themselves under an enfilade fire.

"Look! Look! What's this? What are they doing?" shouted Raidkin, and in his voice there was a ring both of pleasure and of perplexity.

And as I looked and looked, without once taking my eyes off my binoculars, I could scarcely credit what I saw; for the Japanese vessels had suddenly begun to circle "in succession" to port and back to their original course.

If my readers bear in mind what was said in the earlier part of this account, regarding circling movements,[1] then it will be clear to them that in such a manœuvre all the Japanese vessels must pass

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[1] *Vide* note at foot of page 215 of the February issue of this JOURNAL. —W.E.G.

"in succession" through the point at which the bows of each vessel would be end on. At this point they would be as though motionless on the surface of the sea. This fixed position, then, would considerably facilitate our aim. And, moreover, even though they were capable of steaming at a speed of 15 knots, the time required for such a change of formation would occupy about 15 minutes, during which those vessels, which had already turned, would impede the fire of those which had still to pass through the point of turning.

Raidkin could not restrain himself from exclaiming: "What a piece of folly! Surely we must immediately let drive at their bows."

"God grant it!" said I to myself. It was clear to me that Togo had perceived something of the unexpected, and that he had come to a fresh and sudden decision. The manœuvre was unquestionably a risky one, but, on the other hand, if he had found it imperative to set a reverse course, no other method was possible. He could, indeed, have directed his vessels to circle "together," but then the van leader, in the battle now pending, would have been the sternmost cruiser, "Iwate." Evidently Togo did not wish to allow this, and so he decided upon a circling movement "in succession," so that he might lead his fleet in person and not place the success of the opening of the battle in dependence on the presence of mind and spirit of enterprise of his Junior Squadron Commander (for the "Iwate" bore the flag of Rear-Admiral Simamura).

My heart beat as it had not beaten since the six months which I had spent in Port Arthur. "If we should be successful! Grant it, O Lord! Even if we cannot sink it, may we force but one vessel out of the battle line! It will be our first success. Will it, indeed, be possible?"

Meanwhile our Admiral hastened to take advantage of the favourable situation.

*Time, 1.49 p.m.*—When out of the Japanese vessels only the "Mikasa" and "Shikishima" had succeeded in lying on the new course—two vessels out of twelve—and when their fleet was at a distance of 32 cables' length from us,[1] the first shot was fired from the "Suvóroff," and after it roared the guns of all our vessels.

I eagerly looked through my glasses to see with what result. Our projectiles, both over range and under range, fell close to the mark, but those of the most interest, viz., the obvious hits, as in the fight of the 28th July (9th August), did not appear to have had any effect. It should here be stated that our shells are so constructed that, as they burst, they emit scarcely any smoke, and, moreover, their fuses are so adjusted as to cause the charge to burst only after the shell has penetrated the frame of a vessel. Whether they have hit, therefore, or not, can only be observed when either something from an enemy's vessels is carried away, or when there are other unmistakable signs of damage. But I could not perceive any such signs of injury.

Two minutes later, when another pair of their battle-ships, the "Fuji" and "Asaki," had also circled into the new course, the Japanese began to reply to our fire.

At first their shots went well over us. Some of their long projectiles, at this distance, turned right over, and then, as could be

[1] About 3¾ miles.—W.E.G.

well seen with the naked eye, after whirling, like a stick thrown in a game of skittles, flew across our bows, not with a terrible roar, as a shell generally does, but with a sort of idiotic murmuring sound.

"Are these the 'Chemodáni?'"[1] inquired Raidkin, with a laugh.

"The very same," I replied. And yet there was something else that now struck me, viz., that these "Chemodáni," after turning right over in their flight through the air, immediately burst, even if they only fell into the sea. This was not so on former occasions.

After the flight of projectiles of too great a range, came others short of the mark, followed by those coming nearer and yet nearer. Splinters from these, then, either hurtled through the air, or clanged against the sides or superstructure of the vessel. Presently, close to, and opposite, the foremost funnel, there rose up a gigantic column of water, mingled with smoke and flames. Men were then seen running with stretchers up on to the fore bridge, and I crouched down over the handrail.

"It is Prince Tsereteli!"[2] was the shout that came down from Raidkin, as if in response to my inaudible question, as he rushed off into his turret.

This last shot had struck the centre of the 6-inch turret, and afterwards something fell heavily behind, and beneath me, in the direction of the port quarter. From the after companion poured out smoke and tongues of fire. Another shot, after falling into the captain's cabin, and piercing the deck, burst in the officers' quarters, and there caused a conflagration.

And here, and not for the first time, I could observe that kind of stupor which takes possession of a body of men, unaccustomed to being shot at, at the first falling around them of the enemy's projectiles. This stupor, which so easily and quickly arises from the most trifling external blow, may, according to its character, either develop into terror, that is quite ineradicable, or into unwonted buoyancy of spirits.

The men, who were at the fire pumps and hoses, stood as though they were bewitched, gazing at the smoke and flames, literally not understanding what to do. I had, therefore, to rush down to them from the bridge, and in the simplest words, as if speaking to a child, to say: "Don't be confused! Pump on the water!" and so induce them to pluck up courage and boldly throw themselves into the work of putting out the fire.

I had pulled out my watch and notebook, so as to jot down an entry of the first outbreak of fire on board, but at this very moment something gave me a sharp prick in the waist, and something else that was huge but soft fell heavily on my back, knocked me over, and threw me forward on to the deck. When I again rose to my feet, I found that I was still holding my watch and notebook. The watch had not stopped, but the second-hand was bent, and the glass had disappeared. Stunned by the blow, and not yet quite myself, I began to search diligently for the missing glass on the deck, and I at last

[1] The name given in Port Arthur to the Japanese long projectiles of large calibre. They had a diameter of 1 foot, and were more than 4 feet long. Might they not, then, properly be likened to a portmanteau or small trunk, filled with some explosive material?—*Author.*

[2] Flag-Midshipman Prince Tsereteli.—*Author.*

found it intact. I took it up and restored it to its place. And then, for the first time realising that I had been occupying myself about a very trivial matter, I cast a glance around. No doubt I must have lain where I fell for some moments in an unconscious state, because I now saw that the fire had been put out, and that, besides the bodies of two or three dead men, that lay close to me, and upon which the water from the rent hoses was spouting out, there was no one near me. The blow which I had experienced had evidently come from the direction of the round-house in the stern, which was hidden from me by a traverse constructed out of hammocks. Glancing in that direction I then looked through a gap, for I knew that there must have been here, at the time of the explosion, the following flag officers:—Lieutenant Novosiltseff, Midshipman Kozákevitch, and Volunteer Maksimoff, with a party of poop-deck signallers. A shell had passed through the stern round-house, completely demolishing its circular plates. Some 10 or 12 signallers were at the time either standing to starboard of the 6-inch turret, or were lying near it in dense groups. Inside the round-house were the mangled remains of some one, and there still hung suspended a telescope of officer's pattern.

"Is this all that is left?" thought I. But this was a mistake, for, by some sort of miracle, Novosiltseff and Kozákevitch had only been wounded, and, with the aid of Maksimoff, had gone to the dressing-station. This had all taken place either whilst I was lying unconscious on the deck, or had been busying myself about my watch-glass.

"I say, is this a familiar scene to you? Is it like that of the 28th July (9th August)?" said the indefatigable Raidkin, as he peered out of his turret.

"It is in every respect the same," I answered in a confident tone, but this was not a sincere statement, for it would have been more correct to have said, "it is altogether unlike it."

Seeing that on the occasion to which my questioner had referred, in an engagement that lasted for several hours, the "Tsarévitch" was hit by only nineteen of these large projectiles.

I had, indeed, seriously intended during the battle, which I am now describing, to note the number of hits, and of the parts of the vessel struck, and also the extent of the damage done by each impact, but how could I go into such detail when even to count the number of hits seemed impossible? Such firing I had not only never seen, but I had never pictured to myself anything at all like it. Projectiles were showered upon us incessantly, and they fell on the vessel one after the other.[1]

During the six months that I was with the Port Arthur Squadron, I had made it my duty at all times and in all places to acquaint myself with everything, and so *Shimosa* powder and melinite were, to a certain extent, old acquaintances, but here was something that was altogether new to me! It seemed that not mere projectiles struck our

[1] Japanese officers have related that after the capitulation of Port Arthur, in expectation of a second Russian Squadron, they had made every preparation to meet it, and, therefore, each Gun Captain had been allowed to fire from his gun at a mark five fully charged projectiles. And afterwards all unserviceable guns were replaced by new ones on each vessel.—*Author.*

sides or fell on our deck, but entire mines. Moreover, these mines exploded in the first impact against anything, or on the very slightest resistance to their line of flight. A handrail, the stay of a funnel, the blocks on the davits, any of these objects was sufficient to cause an instant explosion. The steel plates on the ship's sides, and the superstructure on the upper-deck, were torn and twisted into tangled masses, and with fragments of these were our men struck down. Iron ladders were twisted, so as to resemble wheels. Guns, not themselves damaged, were wrenched off their mountings.

Such destruction could not have been effected either by the force of the impact of the projectile itself, much less by the force of the blow of mere fragments. It could only have been the result of the power of the explosion. It would seem then that the Japanese had succeeded in realising the idea which the Americans essayed to accomplish in the construction of their dynamite gun "Vesuvius."

Then again, the unusually high temperature of the explosive was manifest, whilst the liquid flame, which it emitted, seemed as though it would inundate everything! I saw, with my own eyes, how, after the explosion of a shell, a steel plate threw out sparks. Of course, I do not mean to assert that the plate was fused, but that its painted surface was scorched! Such materials, not easily ignited, as hammocks or chests placed in several rows, as traverses, and then filled with water, instantly burst into a bright flame like a kindled torch. At times, even with the aid of glasses, nothing could be seen, so dimmed and distorted were the outlines of all objects from the vibrations of the glowing atmosphere.

No! it was not at all like the battle of the 28th July (9th August).[1]

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[1] According to certain information, which is fully worthy of credence, it was in the battle off Tsu-shima that the Japanese used for the first time a new explosive to mix with the charges in their shells. The secret of this composition is said to have been bought, during the earlier stages of the war, from its inventor, a Colonel in the service of one of the South American Republics. According to report, it was found that only guns of the largest calibre, such as are used in battle-ships, could be supplied with shells filled with the newly discovered explosive. Hence was it that those of our vessels, which had engaged with vessels belonging to the Japanese Squadron, under Admiral Kataoka, did not undergo such destruction nor suffer from such outbreaks of fire, as did those which were attacked by the Japanese battle-ships and armoured cruisers in this battle. The cases of the "Svietlána" and "Dimitri-Donskoi" are especially convincing examples of this. On the 15th (27th) May the "Svietlána" was under fire from two of the Japanese light cruisers, and the "Dimitri-Donskoi" under that of five vessels of the same type. Now both these vessels in the first place defended themselves successfully for a long time, and in the second place—and this is the chief point in the comparison—they were not set on fire, although, in the material of both vessels—the "Donskoi" being a vessel of an old type, and the "Svietlána" resembling a yacht—there was much material that was inflammable, not merely in a comparative, but in an absolute sense. Material, that is, of a kind that was incomparably far more extensively used in them than on board our newer battle-ships.

In the construction of naval artillery, from the most ancient times, two aims have been kept in view, which are in sharp contrast the one

with the other. The one aim has been to inflict on an enemy's vessels once for all a few but deeply seated and heavy blows, involving a *maximum* amount of damage—such as the breaking down of their motive power, the piercing of their frame beneath the water-line, the blowing up of the magazine; in a word, the speedy forcing of each vessel out of the fighting line. The other aim has been to inflict, in as short a time as possible, as many injuries as possible, injuries, that is, of some sort, even if they be superficial and immaterial, and to use every endeavour to go on "pounding" a vessel, so as to knock it to pieces. Those, who have advocated this method, have maintained that it would not be difficult to finally destroy such a battered vessel, and, if not, that it must sooner or later sink of itself.

In the case of modern artillery, and in the pursuit of the aim first mentioned, it would be indispensable to have massive and thickly-walled projectiles, capable of piercing any armour, the inner chamber being regulated according to the amount and nature of the explosive used. Such projectiles would have to be furnished with percussion tubes, contrived so as to delay the explosion of the charge until the projectile had penetrated the frame of the vessel. Those, on the other hand, who pursue the other aim, advocate a method which is exactly the opposite of the first method of construction. They say that for such projectiles only that degree of solidarity of wall construction is requisite, as will insure the charge not bursting too soon. In the case of this method, the thickness of the walls of the projectile is reduced to a *minimum*, whilst the inner chamber is so far increased as to allow the extremest limit to the quantity of the explosive force, but in this case the percussion tube must be so regulated as to cause detonation at the first moment of impact.

The first view has reigned principally in France, the second in England. In the late war we have shown ourselves to be the adherents of the first method of shell construction, the Japanese of the second.—*Author.*

(*To be continued.*)

# NAVAL NOTES.

Home.

The following are the principal appointments which have been made: Captains—J. F. Green to "Egmont" for Malta Dockyard; H. H. Tothill to "Centurion"; C. E. Anson, M.V.O., to "Vengeance"; R. A. Allenby, M.V.O., to "Argyll"; T. W. Kemp, C.I.E., to "Europa"; J. Casement to be Superintendent, Sheerness Dockyard; the Hon. S. Hawke to "Charybdis"; H. F. Oliver, M.V.O., to "Achilles"; S. A. Hickley to "Illustrious"; W. O. Boothby to "Leviathan"; G. C. Cayley to "Blake"; W. O. Story to "London"; C. H. Moore to "Hood"; C. F. Sowerby to "Cumberland."

Admiral Sir C. C. Drury, K.C.B., K.C.S.I., hoisted his flag on board the first-class battle-ship "Queen" at Portsmouth on the 20th ult., and left the same day in his flag-ship to take up the command of the Mediterranean Fleet.

Admiral Lord C. Beresford, G.C.V.O., K.C.B., hoisted his flag at Portsmouth on the 15th inst. on board the "King Edward VII." on his return from leave, and left the same day for Portland to take up the command of the Channel Fleet.

Rear-Admiral G. A. Callaghan, C.B., hoisted his flag on the 5th inst. on board the first-class armoured cruiser "Leviathan" at Chatham, upon taking over the command of the new Fifth Cruiser Squadron attached to the Home Fleet at the Nore. The same day, also at Chatham, Rear-Admiral S. Lowry hoisted his flag in the first-class battle-ship "Illustrious," as Rear-Admiral in the Channel Fleet, in succession to Rear-Admiral Callaghan.

The first-class battle-ship "Albion" completed to her full sea-going complement at Portsmouth on the 26th ult., and has joined the Atlantic Fleet.

The first-class armoured cruiser "Aboukir" left Plymouth on the 17th ult. for the Mediterranean, where she relieves the first-class armoured cruiser "Carnarvon."

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*Launch of the "Indomitable."*—"The new first-class armoured cruiser "Indomitable" was launched on the 16th ult. from the yard of the Fairfield Shipbuilding Company at Govan, on the Clyde. She is one of three sister-ships, the other two being the "Invincible," building at Elswick, and the "Inflexible," at Clydebank.

The official figures give, according to the *Times*, the length of these vessels as 530 feet, the beam as 78 feet 6 inches, and the mean load draught as 26 feet. This is an increase on the largest armoured cruisers of the Navy of 50 feet in length and 5 feet in breadth, with 1 foot less in mean load draught. The weight of the hull, including the armour and backing, is to be 9,660 tons, and the displacement at load draught 17,250 tons, an increase in displacement of 3,700 tons, and in weight of 1,645 tons. The coal capacity is 1,000 tons at load draught in both classes, and here the statistics concerning the vessel must for the present stop, because the construction has at present proceeded no further than the hull. The larger dimensions, however, and the lighter draught indicate a greater capacity in power and armament.

**Home.**

The speed aimed at is currently reported to be 25 knots, with 41,000 I.H.P. There is little doubt that the yacht-like proportions of the hull and the care which must have been taken to verify the effectiveness of the design will ensure that these results will be achieved. The armour of the vessel extends in a broad band of 7-inch plates nearly the whole length of the ship, but tapering down to four inches at the ends. The armour completely covers the vitals of the vessel from below the water-line at low draught to within a short space of the upper deck. The armament is to consist of eight 12-inch guns equal to 381,576-foot tons per round, and they are to be so placed that the whole eight can be fired as a broadside port and starboard at will.

The essential characteristics of the protected cruiser consist of a high speed and an arched armoured deck defending the vitals of the ship. The first realisation of this branch of naval defence was the twin-screw "Magicienne," launched from Fairfield yard in 1888; she measured only 265 feet long by 42 feet beam and 17 feet 6 inches depth; her displacement was only 2,950 tons, as compared with the "Indomitable's" 17,250 tons. These figures exhibit the extraordinary advance made in the 19 years intervening from the launch of the first protected cruiser to the latest development of the armoured cruiser as we now understand the term. The "Magicienne" was followed in 1896 by the "Diadem," also from the same yard—the first vessel of the class to be fitted with Belleville boilers and economisers. She was followed three years later by the "Cressy," which cruiser was furnished with side armour. The next pronounced advance was the "Cochrane," of last year, which exceeded the speed of the "Drake" class, reaching 23·3 knots, with heavier guns and an equally thick armour belt. The 13,660 tons of the "Cochrane" is now followed by the "Indomitable's" 17,250 tons.

The "Indomitable," like her sisters, has been designed by Sir Philip Watts, and she is to be delivered not later than 22nd May, 1908.

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*Important Torpedo Trials.*—Important trials took place recently at the torpedo range of Messrs Whitehead, Weymouth, with a torpedo which was fitted with a new arrangement for heating the air used to propel it. The new heater was designed by Sir W. G. Armstrong, Whitworth & Co., after lengthy experiments. The design was explained to Captain Tanaka, the senior officer of the Japanese Commission in England. He obtained permission from his government to have an apparatus fitted to one of the torpedoes to be left behind for the purpose from the battle-ship "Kashima." The torpedo so fitted was the subject of the trial.

Proposals have for some time past been made to heat the compressed air in a torpedo partly with a view to obtaining more energy out of it, and therefore either higher speed from the torpedo or longer range at the same speed, and partly because the present torpedo is almost useless when the sea water is at a very low temperature, a fact which in a great measure accounted for the large expenditure of torpedoes, without result, during the cold weather off Port Arthur.

The first torpedoes to be fitted with heaters were made in the United States by the Bliss Leavitt Company. Their system was to burn liquid fuel in the actual main reservoir. A torpedo fitted on their system, but considerably modified, was supplied by Messrs. Armstrong to the Admiralty, and went through its trials with success. There was, however, a good deal of apprehension on the part of the torpedo experts on account of the heat being applied to the air in the main reservoir. It was argued that by carelessness or accident a dangerous pressure might

Home.

be reached, and that if the bursting of so large a chamber did occur, very serious results indeed would ensue. It was on account of these apprehensions that Messrs. Armstrong carried out experiments with the hope of finding some simple means of heating the air in a separate and very much smaller vessel. Their experiments were crowned with more success than they had dared to hope.

It is evident that the amount of weight to be carried by a torpedo must be strictly limited. In order to get as much power out of the engines and as much explosive in the head as possible, the existing torpedo has exceedingly little margin for more weight in the shape of a heating arrangement. To carry a separate vessel in the body of the torpedo, which had to act as a furnace for heating the air as it passed from the main reservoir to the engines, seemed almost out of the question on account of weight alone. Certainly, no torpedo of dimensions anything like the existing pattern could have carried the heating vessel, or combustion chamber as it is now called, which was first experimented with. But as the experiments proceeded it was found possible more and more to reduce the size of the combustion chamber, until at length practical dimensions were reached, and then permission to fit a torpedo was, as already explained, obtained from the Japanese Government.

It was shown at Weymouth that a torpedo fitted with a heater could travel for double the distance at a given speed and the same expenditure of air that the torpedo without heater could. In other words, there was a gain of about 100 per cent. in power due to the heater. If the torpedo be run for the same distance with a heater as a similar torpedo without a heater, the 100 per cent. gain of power would be realised by increasing the speed, and at a range of 2,000 yards this increase is from 26 knots to 33·5 knots. This speed of 33·5 knots is the highest which has ever been realised with a torpedo for a range of 2,000 yards.

There is no doubt that, if the torpedo were constructed especially to use hot air instead of cold air as at present, the gain in power would be greater, and it has been decided to proceed at once with the designs of a new torpedo.

The experiments could not be resumed on the day intended owing to the heavy weather. The Japanese and other officers and the representatives of the Whitehead and Armstrong firms went to the range, but the tests were not proceeded with for the reason mentioned.

The experiments were resumed on the following day in the presence of representatives from the Admiralty and the Japanese Government. On this occasion the heater was set to give a higher temperature, and a speed of 35·3 knots was obtained for a distance of 2,000 yards. This is a gain of 9·3 knots, or 35 per cent., over the 26 knots which can be obtained with a similar torpedo not fitted with the heater for the same distance run. The designers are confident that they can obtain an even higher result by going to a higher temperature. Experiments will shortly be carried out with a view to testing this.—*Times.*

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France

The following are the principal promotions and appointments which have been made: Rear-Admiral—E. M. Léon to be Admiral-Superintendent at Lorient. Capitaines de Vaisseau—P. L. A. Chocheprat, E. M. Leon to be Rear-Admirals. Capitaines de Frégate—J. A. Habert, L. A. J. Mottez, T. A. Allaire, M. E. Morier to be Capitaines de Vaisseau; G. P. Collas to "Epée" and command of 2nd Torpedo Flotilla in the Mediterranean; L. Jourden to "D'Estrées"; A. C. Ricquer to "Cassini";

**France.** L. J. André Fouët to "Forbin"; S. H. Mortenol to "Pistolet" and command of 2nd Torpedo Flotilla in Chinese waters.

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Rear-Admiral Léon, who has been appointed to succeed the late Rear-Admiral Massenet at Lorient, took up his new duties on the 10th inst.

The first-class battle-ship "Carnot" has been withdrawn from the 1st Division of the Reserve Fleet at Toulon to take the place of the "Iéna" in the 2nd Division of the Mediterranean Fleet, the first-class battle-ship "Bouvet" taking her place in the 1st Division of the Reserve Fleet. The Active Mediterranean Battle Fleet is thus, for the time being, reconstituted as follows:—

*First Division.*

First-class battle-ships—"Suffren" (flag-ship), "Charlemagne," "République."

*Second Division.*

First-class battle-ships—"Saint Louis," "Carnot," "Gaulois."

The 1st Division of the Reserve Fleet, under the command of Rear-Admiral Kiésel, will now consist of:—

First-class battle-ships—"Masséna," "Bouvet," "Jauréguiberry."

And the 2nd Division, under the command of Rear-Admiral Germinet, of:—

First-class battle-ships—"Brennus," "Hoche," "Charles Martel."

The Minister of Marine has decided that for the future the two Reserve Divisions of the Mediterranean Fleet shall be styled the 3rd and 4th Divisions of the Mediterranean Fleet.

The second-class cruiser "Chasseloup-Laubat" commissioned at Lorient on the 10th inst. for service in the Atlantic Division, where she will replace the "Jean Bart," which is now considered as a total wreck.

The wireless telegraphy school, which, after the burning of the "Algeciras," had been provisionally transferred to Port Vendres, is to be reinstated at Toulon on board the cruiser "Cécille."

*Steam Trial.*—The new first-class armoured cruiser "Victor Hugo" has successfully completed her steam trials at Lorient. At the six hours' coal-consumption trial, with the engines developing 8,948-I.H.P., the consumption was 651 gr. (1·44 lbs.) per I.H.P. per hour, and 76 kg. (167·56 lbs) per square metre of grate surface, giving a speed of 12 knots. At the 24 hours' trial the coal consumption was 77 kg. (169·75 lbs.) per square metre of grate surface, and 668 gr. (1·50 lb.) per I.H.P. per hour, with the engines developing 16,000-I.H.P., giving a speed of 18 knots. At the 8 hours' full-speed trial the engines developed 29,000-I.H.P., giving a speed of 23 knots—a knot in excess of the contract—with the side engines making 130 revolutions and the central one 125, while the coal consumption was 777 gr. (1·69 lb) per I.H.P. per hour, and 143 kg. (315·25 lbs) per square metre of grate surface.

*Boiler Accident.*—Another boiler accident, due to the rupture of a tube, has to be recorded, this time on board of the destroyer "Kabyle," off Toulon, but luckily the consequences were not so serious as at first reported.

The "Kabyle" was on her trial at the time, which had proceeded satisfactorily for two hours, when about 10 a.m. a crackling noise was heard, and immediately the stokehold was filled with flame; all the men there were more or less hurt, and were got out as soon as possible and sent to the Saint Mandrier Hospital, where it was found that an engineer and seven men were badly, but not dangerously, burnt.

The boilers of the "Kabyle" are of the "Solignac-Grille" type, and it is the first time that this kind of boiler has been used in the French Navy, though used in merchant steamers and on shore. The crack in the tube has a length of 20 centimetres. France.

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*New Submarines and Submersibles and Destroyers.*—The Minister of Marine has ordered the commencement of 16 submarines, namely, 3 at Cherbourg, 7 at Rochefort, and 6 at Toulon. All are of the submersible type, similar to the 18 commenced in 1905. Their displacement is 398 tons, length 51 m. 12 (167 feet), beam, 4 m. 97 (16 feet), draught of water, 3 m. 12 (10 feet). The maximum power of the motor is 700-H.P., giving a surface speed of 12 knots; they will be fitted with 7 launching apparati for torpedoes, and are to have a complement of 2 officers and 22 men.

The Minister of Marine has also issued orders for the commencement of four submergeables of much greater dimensions than those hitherto built; they are to be constructed in the Government dockyards: two at Cherbourg, one at Toulon, and one at Rochefort. The designs are not actually settled, but it is said they are not to be identical, and that the displacement will be about 800 tons, and length 70 metres; the surface speed is to be 15 knots, being 2 knots faster than all previous craft of this type, and the submerged speed will be 10 knots instead of 6 knots. Above all, the radius of action is to be far greater than hitherto attempted, namely, 2,500 miles. The two to be built at Cherbourg are from the designs of MM. Hutter and Radiguer, the one at Toulon after M. Maurice's plans, and the one at Rochefort after M. Bourdelle's.

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The contract has been signed for the construction of six destroyers by private firms, to be named "Hassard," "Volligeur," "Tirailleur," "Chasseur," "Spahi," and "Carabinier." They are larger than those hitherto constructed for the French Navy, having a displacement of 400 tons, against a previous 330 tons, and will cost 2 million francs (£80,000) each.

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*Launch.*—The destroyer "Coutelas" was launched at Rochefort on 13th January. Her dimensions are as follows:—Displacement, 336 tons; length, 190 feet; beam, 21 feet 6 inches; speed, 28 knots. She carries one 65-mm. gun, four 47-mm. guns, and has two torpedo tubes. Her complement is to be 4 officers and 58 men. She was commenced in May, 1905, and her cost is £1,438,803 francs (£57,452).

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*New Pilotage Schools.*—A Ministerial Decree has been issued establishing four schools of pilotage for coxswains of torpedo-boats at Cherbourg, Brest, Lorient, and Rochefort. Instruction will be given in coastal pilotage for the northern and western maritime arrondissements.

Contracts have been concluded with the "Compagnie Générale Transatlantique," by which their steamers "Lorraine," "Lavoie," "Louraine," and "Provence" will, in future, be reserved as auxiliary cruisers for the Navy, and also with the "Compagnie des Messageries Maritime," by which their steamers "Amazone," "Magellan," "Tonkin," and "Tourane" will also be reserved for the same purpose.

**France.** *M. Lockroy's Letters in the "Temps" on the French Navy (continued).*—The necessity for reform is shown by one curious and undeniable fact: France annually devotes to her Navy a sum varying between 300 and 320 millions of francs, while in other countries with far less expenditure a much greater return for the money, in a military sense, is obtained. If, for example, we take the German Naval Estimates from the commencement of the century, it will be seen that in the first year they are 100 millions less than ours (191 against 291), and afterwards 53, then 47, then 51, then 34, and that they are now less by 27 millions; altogether this century we have expended 282 millions more than Germany, and, nevertheless, during this period the Germans have largely reduced the superiority which we formerly held. People will try to manipulate these figures; it will be said that the Budgets of the two countries are not comparable; that supplementary credits must be taken into account, and there are included in our Estimates the charges of the *caisse des invalides*. All this is true, but the supplementary credits voted by the Reichstag are not larger than those voted by our Parliament, and the German Budget also is inclusive of charges for pensions and retirements. It is not to be denied that the comparative youth of the German Navy gives it advantages over ours, but it is none the less true that Germany employs her money better than we do; that with small means she does much, and with great resources we do little, and that if we do not change our system, things can only go from bad to worse.

Among the vices of our organisation, by no means the least is the superabundance in our staff of employés. If anyone visits, as I have done, the different European arsenals, neither at Karlscrona in Sweden, at Pola in Austria, at Spezzia in Italy, at Wilhelmshaven in Germany, nor at Portsmouth in England, will he see such a luxuriance of administrative vegetation. Where foreign countries have one employé we have two, three, and sometimes four, overburthening, without reason, the Budget. These are extravagancies which must be curtailed and reduced to their strictest minimum.

I need hardly say that I do not suggest wholesale or even partial executions; we are not like England, where, in replying to a question in Parliament regarding the dismissal of 3,000 workmen, the Minister was able to say: "I put the interests of the country before those of our workmen, however worthy." We are obliged to respect vested interest; the State has made certain promises which must be observed, but we can resist Parliamentary pressure and avoid the filling up of vacancies as they occur, and thus by degrees diminish our excessive *personnel*.

In a remarkable and well-informed report, Commandant Abeille, Sub-Director and Professor of the Naval Staff College, has denounced this administrative excess. He shows how Germany completes the monthly accounts of her arsenals with the help of 298 employés, among whom are included all as low as those who receive a yearly salary of 1875 francs, and that France, though often behindhand with her accounts, employs 735 functionaries for the same purpose, whose minimum salary is 2,200 francs. To her 298 employés Germany adds 300 clerks, and to her 735 France adds 800—quite an excessive proportion in itself; but besides this we have taken from the workshops for clerical work an additional 1,200 men, who have been given the title of "technical writers." It is true that reforms and changes in the method of keeping the accounts have been introduced by M. Delorme, but surely no one could have imagined that this would necessitate so great an addition to the clerical *personnel* as to raise it to at least double the number that Germany finds sufficient. M.

France.

Abeille adds that the public will be astonished to know that if the administrative *personnel* of our dockyards were reduced by one-third only —leaving us still a more numerous staff than Germany—that there would be a saving of 12,300,000 francs! It would almost secure salvation! With this sum we could increase our fleet by one battle-ship or its equivalent every three years, and should recover a portion of the advance which Germany has gained on us. I am aware that reforms, and particularly those which have to do with the *personnel*, cannot be effected in a day; time, patience, and consistency are necessary. But by degrees we could relieve our Navy of these charges which press so heavily and retard her advance. We must, however, give up old methods and introduce a new and severer administrative life.

When, for instance, vacancies take place among the dockyardmen, which it is not intended to fill up, it is no economy to enrol an equal number of apprentices, who will remain a charge on the nation for ever.

It has been rightly observed by M. Ferrand that if a workman be once entered in the arsenal, be it only for 24 hours, it is beyond human power to turn him out; he is there for the remainder of his life, and only leaves at last for the cemetery. It is well known that all the inhabitants of our naval ports seek to enter the arsenal, though all the time complaining that dockyard workmen are the worst treated people in the world. Though these sentiments appear contradictory, something must be said for this point of view, because the wages are undoubtedly small, but the advantages also are considerable, the two things which press most heavily on the working classes, namely, the distress caused by strikes and the misery due to old age, being absent. There may be a scarcity of work, but the dockyardman still receives his wages. Science may invent new labour-saving appliances, but, unlike the outside workman, he is still kept on, even though not required, and finally, when past work, he becomes entitled to a civil pension.

Enrolled in the service of the nation, in the interest of its defence, these privileged workmen have neither the right to deny the country which pays them, nor to revolt or strike against their master, the French taxpayer. If they consider themselves unfairly treated, or if their opinions prevent them from conscientiously serving the State, they are free to leave its service; but if, on the contrary, they think the advantages they receive in one way compensates them for the disadvantages they receive in another, they should give up threatening the Government and be content to do their work in peace.

I do not mean to say that the Government has not also its duties towards them, or that their wages should not be increased as far as possible; but it has also its duty to the nation, namely, to reduce the number of workmen now employed to practical limits; to retain at great expense hands which are no longer necessary is to squander the public money.

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Russia.

The following are the principal promotions and appointments which have been made:—

Admiral—Dikoff to be Minister of Marine and Commander-in-Chief of the Navy. Rear-Admirals—von Jessen, Rodinoff, to be Vice-Admirals; Beklemyschew to be Second-in-Command of the Baltic Fleet; Jakowlev to be Chief of the Staff at the Ministry of Marine; Bostrem to be Assist-Minister of Marine.

**Russia.**

*General.*—The course of instruction at the Nicolaiev Naval Academy has now been extended to 12 months, being the 6 winter months of two years, the remainder being spent by the students in their regular duties. Staff officers of the fleet and lieutenants of not less than six years' standing, preferably those who have already passed through an Academy or in some special subject, such as torpedo or gunnery, are eligible.

It has been decided, after due consideration by the Council of State, to form at Port Alexander III. an instructional flotilla for submarine work. The expenditure thus occasioned is to be provided in next year's Estimates by the Imperial Treasury, and for the present year out of the reserve fund for construction.

It is under consideration whether it would not be advisable to change the white "frocks" and other undress garments for some other colour, such as khaki or a greenish hue. To secure invisibility, the head-gear would at the same time be altered to some other colour.

The Naval Technical Committee has decided to order no more of the Temperley coal hoists. Small straight whips, such as are used in the American fleet, with a lifting power of half a ton, will be adopted in place of them. The reasons given for this decision are that they are cumbrous and heavy, and easily spoilt, and the amount of coal that they lift is small, and it is found that unless the collier is immediately under the hoists the coaling cannot be properly carried out.

It is proposed to make alterations in the regulations as to the Naval Cadet Corps, chiefly with a view to extending the right of entry to it, and also rearranging the passing out of cadets, and their promotion to midshipmen. In addition to the sons of naval officers and hereditary gentry, it will now be open to the sons of military officers and of first-class engineer artificers, doctors, ships' engineers, and various non-combatant members. The existing division into two categories, according to origin, with privileges attaching to the first to be done away with, is also to be established. It is, however, only right that preference should be given to the sons of those killed in action or who die of wounds in awarding appointments to vacancies on the free list. After eight months' service in foreign waters as substantive cadets, cadets are to be subjected to an examination in practical professional knowledge. They are then to become midshipmen or junior constructors or mechanics, according to their branch of the Service.

It is proposed to create in Russia as in France a sailor class or "degree," from which the Navy may be recruited with men trained for service at sea. These would comprise :—(1) Voluntary enlistment from the Mercantile Marine; (2) Inhabitants of the coast employed in fishing or seagoing; (3) Men freely joining the class; and (4) Reserve men of the Navy planted in maritime settlements on unoccupied portions of the coast. Various privileges would be granted them, such as all posts in the Mercantile Marine, at ports, in the pilot and lighthouse service, and life saving, and also the right to trade and fish by preference both at sea and in fresh water, and that of importing fishing and other gear free, or nearly so, with credit for commercial undertakings from the Imperial Bank.

An examination made of the steel and wood sheathing of the first-class cruiser "Diana," after eight years from her launch, showed both to be in excellent condition, without any cracking, and the wood had kept its place without warping. As regards the double-bottom, the plates of the inner one readily bent, and gave under the blows of the mallet about the boiler compartment, the engine bulkhead, and the longitudinal bulkhead of the bunkers.—*Kronstädtki Viestnik.*

*Launches.*—The new Russian first-class armoured cruiser "Rurik," which was launched on the 17th November, 1906, by Messrs. Vickers, Sons, & Maxim from their naval construction works at Barrow-in-Furness, is of special interest, since she may fairly be assumed to embody the results of experience hardly won in actual fighting during the Russo-Japanese war. The old "Rurik" was thought a remarkable vessel when she was launched 16 years ago, but as a fighting machine she is far outclassed by her successor. She was 426 feet long, 67 feet in beam, 29¾ feet in draught, and of 10,940 tons displacement, while her engines developed 13,500-I.H.P., and gave her a speed of 18·7 knots. The new "Rurik" is 490 feet long, has a beam (moulded) of 75 feet, is 26 feet in mean draught, and displaces 15,000 tons. Her two sets of four-cylinder, triple-expansion, balanced engines are to develop together 19,700-I.H.P., transmitted to two three-bladed propellers by hollow propeller shafts 19 inches in diameter, and designed to give her a speed of 21 knots on trial, with 1,200 tons of coal on board, which is the amount she is calculated to carry at normal draught. Her 28 Belleville boilers supply steam at a pressure of 250 lbs. to the square inch, and it is stipulated that the trial speed of 21 knots must be attained with one-quarter of the number out of use; they have a total heating surface of over 55,000 square feet, and are fitted with arrangements for burning oil fuel, of which the ship carries 200 tons, in addition to her coal. In regard to armament, the old "Rurik" had four 8-inch breech-loading guns, one 6-inch and six 4·7-inch Q.F. guns, and six torpedo tubes. The new "Rurik" will have four 10-inch breech-loading guns, eight 8-inch and twenty 4·7-inch Q.F. guns, twelve smaller Q.F. guns, and two submerged torpedo-tubes. The 10-inch guns are contained in two barbettes on the centre line, one forward and one aft, while the 8-inch ones are twin-mounted in four barbettes. The armour of the barbettes is Krupp cemented, 7½ inches thick, and the guns, which are 50 calibres in length, are electrically worked. Of the twenty 4·7-inch guns, sixteen are placed on the upper deck in a battery some 200 feet long protected by 3-inch armour, and four stand aft on the main deck in a battery with armour of the same thickness. An armoured belt, 6 inches thick amidships and 3 inches and 4 inches thick at the ends, encircles the ship at the water-line, joining the armour of the batteries. In addition to these protective measures, every precaution has been taken to secure, so far as possible, that any damage sustained shall not put the ship out of action. The conning tower forward, the observing tower aft, and the four range-finding towers are all heavily armoured; but, even if they were all rendered useless, the ship could still be worked from an armoured station under water. The water-tight bulkheads have been made unusually strong so as to withstand high pressures without yielding, and each of the more important water-tight compartments is provided with a powerful electrical pump of its own, to clear it if flooded, the motors being arranged above the water-line. Electricity is very extensively employed throughout the ship, and the dynamos, wiring, etc., are so arranged that in the event of one system being disabled another will be available. The rudder is provided with both electrical and steam steering gears, and has a device by means of which it can be disconnected from both at will, to preclude the possibility of its becoming fixed, by damage or accident, in such a way as to impede the navigation of the ship. The funnel casings are armoured, experience having shown that when they are pierced by shot it becomes very difficult to work and fight the ship owing to the flame and smoke poured out through the holes. Finally, it may be mentioned that in the "Rurik" torpedo nets and booms have been dispensed with, and reliance is placed

**Russia.**

**Russia** on structural arrangements to guard against the loss of the ship by torpedo attack.

The new second-class armoured cruiser "Admiral Makharoff," which was launched last spring from the La Seyne Yard, near Toulon, has the following dimensions :—Length, 443 feet; beam, 57 feet 6 inches; displacement, 7,900 tons, with a draught of 21 feet 4 inches. The engines are to develop 16,500-I.H.P., to give a speed of 21 knots, steam being furnished by Belleville boilers with economisers; the normal coal capacity is 750—1020 tons. Protection is afforded by a water-line belt of Krupp hard steel 7 inches thick, tapering to 4 inches at the extremities, with an upper belt 3·5 inches thick, tapering to 2·7 inches at the extremities. The barbettes are protected by 5·8-inch armour and the casemates by 3-inch armour. The protective deck is 2 inches thick, and the conning-tower 5·4 inches, with a 3-inch communication tube. The armament will consist of two 8-inch guns in barbettes fore and aft, eight 6-inch Q.F. guns in casemates, with twenty 15-pounder Q.F. guns, four 6-pounders, and two submerged torpedo-tubes.

There have also been completed during the last year by the same firm four destroyers, the "Iskussmy," "Ispoinitelay," "Krepky," "Legki," while four others of the same type are completing at Havre. The dimensions of these vessels are :—Length, 185·3 feet; beam, 21 feet; draught, 13·4 feet, with a displacement of 335 tons; the engines are to develop 6,000-I.H.P., giving a speed of 26 knots, while the armament will consist of one 13-pounder, five 3·5-pounders, and two 18-inch torpedo-tubes. Four other destroyers are also being built at Havre of the French "Framée" type, with a length of 187 feet, a displacement of 330 tons; engines to develop 6,000-I.H.P., giving a speed of 26 knots, and the same armament as given above.—*Times*, *Le Yacht*, and *Marine Rundschau*.

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**United States.** *Report of Personnel Board.*—(Note.—The following report has been annotated by the Secretary of the Navy, as indicated in his annual report. Those clauses and sentences of the report of the *Personnel* Board on which he desires to comment are printed in the following in italics. Directly following the italics, and printed within brackets, are the Secretary's comments on the clauses or sentences italicised.)—An examination of the Navy List discloses a condition of affairs under the present law that seriously affects the efficiency of the Service and constitutes a grave menace, if not a positive danger, to the public interests. As taken from the Navy List the average age of rear-admirals on 1st July, 1906, was sixty years and eight months; of captains, fifty-seven years nine months; of commanders, fifty-one years four months; under existing law, on 1st January, 1910, the average ages will be sixty years eleven months, fifty-seven years eleven months, fifty-one years nine months, respectively, and on 1st January, 1914, the average ages will be sixty years seven months, fifty-eight years one month, fifty years eight months respectively. Congress has authorised a considerable increase in the number of midshipmen at the Naval Academy, and these midshipmen upon graduation are promoted to ensign and lieutenant (junior grade). But no provision has been made for a corresponding increase in the upper grades, the result being that the lower grades will become so congested that a midshipman now in one of the lower classes at Annapolis may possibly not be promoted to lieutenant until he is between forty-five and fifty years of age.

And so it will continue under the present law, congested at the top and congested at the bottom, and the country fails to get from the

officers of the Service the best that is in them by not providing opportunity for their normal development and training. The Board believes that this works a serious detriment to the efficiency of the Navy, and is a real menace to the public safety.

Thus it is perfectly plain that an automatic system of promotion must be devised whereby each officer spends a minimum time in each grade to obtain a definite amount of experience in that grade, and there must also be a maximum period to be spent in each grade in order that the amount of service in each should be regularly proportioned from the lowest to the highest.

Having determined upon these cardinal principles, which are deemed necessary to meet the needs of the country, in formulating a plan to put them into effect, the following considerations were taken into account: First, it must be economical; second, that compensation to officers should be proportionate to services rendered; third, that all officers who do not develop special fitness cannot hope to reach the highest rank in the Service; fourth, that there should be some incentive to create competition between officers to encourage them to strive for the distinction of reaching the highest rank.

Now, the duties of the Service are such as to require a certain proportion of officers in each grade, and this proportion, bearing in mind the principles enunciated above (of length of service and experience in each grade), is such that from time to time a certain number of officers must be eliminated from each of the upper grades. The Board considered several methods of accomplishing this; first, by selecting for promotion those officers who by their records and by their known accomplishments are presumptively more fitted than their fellow officers for promotion, and eliminating the latter when their time of usefulness has past, to make way for those below them; second, by what is known as elimination or selection out, whereby when it is necessary to create vacancies for the purpose of keeping up the regular flow of promotion, officers who are least fitted for such promotion are taken from the sea-going or active list.

Officers so eliminated, whether by one or the other of the above plans, could be placed upon the retired list on reduced pay or placed upon a reserve list, their services being utilised so long as they are of value for the performance of special duty ashore. The Board is of opinion that the creation of a reserve list best serves the interests of the country, as services of officers on the reserve list could be utilised at sea in time of war or emergency, and because there are many officers who, while not so well adapted to a life at sea as their fellows, are specially fitted for naval work ashore, and such officers might prefer to serve on the reserve list, where they could use their talents and their abilities to the best advantage.

*Would Save Money.*

After careful consideration of both plans, the Board is strongly of opinion that the second is better suited to our system of Government, of naval education, administration, and organisation, and agrees unanimously with the opinion expressed by the *Personnel* Board of 1897. It was deemed best by every member of the Board to try the process of eliminating the officers who were redundant rather than by selecting the highest for promotion, for although the latter method is ideally the best, it would, in any event, have to be combined with the other, and it would in its actual working be open to far graver objections. Being guided by the fundamental considerations expressed above, the accompanying plan has been evolved. Its details have been carefully worked out, the minimum

**United States.**

number of officers required for the fleet, the number of officers in each grade, the length of time to be spent in each, and the amount of sea service required in each grade, all are based upon the experience of years and upon modern requirements afloat and ashore. It is automatic in its action, being constantly regulated so that there are no sudden flights of promotion nor yet long periods of service in any one grade. It is elastic and can be adapted to any number of officers that may be required for the defence of the country. It is economical, and will, in comparison with the cost of maintenance of the line *personnel* under the present law, on the basis of 1,500 officers, actually result in a saving to the Government in seven years of about 5,000,000 dollars.

Perhaps it would be well to explain the reasons for the Board's recommendations for three vice-admirals. The Government in its naval organisation, in order to conserve its dignity and to maintain discipline, has conferred rank and authority upon certain individuals commensurate with the responsibilities which devolve upon those individuals. Thus, not considering subordinate officers, there are commanders who command cruisers and are available as second-in-command of battle-ships, captains who command battle-ships, and rear-admirals who command divisions, squadrons, and fleets. Logically and naturally, officers who command squadrons and fleets, in keeping with their dignity and the responsibilities of their positions, should have a higher rank than that of rear-admiral, and so, taking into consideration the present size of the fleet, the Board is of the opinion that there should be at least three vice-admirals, one to command the fleet on the Atlantic and one on the Pacific, and one to have a position of the highest responsibility on shore. As the law now stands, the rank of rear-admiral is, in the natural order of things, the highest an officer can look forward to. Thus, upon arriving at that rank, an officer has finished his career so far as rank is concerned. The Board believes that officers should be trained to command fleets just as they are trained to command ships, and that the possibility of promotion to the grade of vice-admiral will stimulate younger flag officers to activities that would be of material benefit to the Service. It is the practice in foreign countries to have vice-admirals and admirals, and the principal Navies have even a greater number of vice-admirals in proportion to the number of officers in the Service and to the number of ships than the Board recommends. This lack of officers of high rank is often embarrassing, for when our fleet meets a foreign fleet, even though the officer in command of the latter be junior in years and with a smaller fleet, he takes precedence over our own commander by virtue of superior rank, thus giving an impression of inferiority to inhabitants of foreign countries.

*Organisation.*

1. The active list of the line officers of the Navy should consist of a sea-going list of 1,500 officers below flag rank, plus those carried as additional numbers. The present list should be increased accordingly by not more than seventy-five numbers annually, in addition to the vacancies normally created during the year, until the total number on the sea-going list be attained, provided: That the numbers comprising the class of midshipmen to be promoted at once under the conditions named in Paragraph 20 of these recommendations be excluded from the computation for the fiscal year in which such promotion takes place.

2. There should be three vice-admirals and twenty-one rear-admirals on the active list, the vice-admirals to be increased in number by one for every increase of the enlisted *personnel* by 8,000.

United States.

3. The number of officers below flag rank should be distributed among the several grades in the following proportions of the whole number of commissioned officers borne as regular numbers below flag rank, viz.: Captains to consist in number of seven per cent. of the whole number; commanders, seven per cent.; lieutenant-commanders, eighteen per cent.; and lieutenants, lieutenants (junior grade), and ensigns, sixty-eight per cent. in all; provided that the numbers fixed in the grades of captain and commander be ninety for each grade until 30th June, 1913, or six years after enactment of law, when each grade of captain and commander is to be increased at the rate of not more than five each year until each grade composes seven per cent. of the total of commissioned officers below flag rank; providing, further, that no one is to be reduced in rank.

4. Vice-admirals should have the rank, pay, and allowances given to lieut.-generals of the Army, and should be retired at the age of sixty-four years, but should not be allowed the privilege of voluntary retirement.

5. A Board should be constituted consisting of five flag officers from the active and retired list senior to all the rear-admirals on the active list, which should recommend to the President of the United States five rear-admirals as eligible for promotion to vice-admirals, *three to be selected by the President and nominated to the Senate for appointment as vice-admirals.* [After consideration of such report the President shall nominate and, by and with the consent of the Senate, appoint three persons to be vice-admirals.] Thereafter whenever a vacancy occurs in the grade of vice-admiral, a Board consisting of five flag officers of the active and retired lists senior to all the rear-admirals on the active list should recommend for such vacancy three rear-admirals on the active list to the President of the United States as eligible for promotion to vice-admirals, *one of whom to be selected by the President and nominated to the Senate for appointment as vice-admiral.* [After consideration of such report, the President shall nominate and, by and with the consent of the Senate, appoint a person to be vice-admiral.]

6. No rear-admiral should be eligible for recommendation for promotion to vice-admiral who has not had at least one year of sea service as flag officer, and the rear-admirals who are selected for recommendation should be those, in all cases, who, in the opinion of the selecting Board, are best fitted to command a fleet of battle-ships in action.

7. There should be formed a list of officers reserved for shore duty only to be known as the reserve list, with the pay and allowances now given to officers on shore duty. Whenever the average age of the officers composing the grade of rear-admiral is more than fifty-nine years, rear-admirals should be permitted to apply to the Secretary of the Navy for transfer to the reserve list, and on the 30th of June of each year, when the average age of said officers in said grade is more than fifty-nine years, the applicants in the order of rank, not to exceed four, by Executive order, should be transferred to the reserve list. Should there be less than four applicants, the Secretary of the Navy should convene a Board of five flag officers senior to all of those on the active list of rear-admirals, who will designate the additional number necessary to cause the transfer of a total of four rear-admirals to the said reserve list on the 30th of June aforesaid, and any rear-admiral transferred to the reserve list should take rank and precedence after the rear-admiral next ahead of him on the sea-going list, and be retired at the age of sixty-two years.

8. Whenever on the 30th of June of each year the senior ten captains *in order of consecutive graduation from the Naval Academy* [in this passage the contingency that some one or more of the ten may not have

**United States.**

been graduated from the Naval Academy seems to be overlooked] average more than fifty-five years of age, or whenever on the 30th June the senior ten commanders in order of consecutive graduation from the Naval Academy average more than forty-eight years of age, a Board of five rear-admirals should be appointed to designate fifteen per cent. of the captains for the reserve list, and similarly on the 30th June of each year when the ten senior lieutenant-commanders *in order of consecutive graduation from the Naval Academy* [in this passage the contingency that some one or more of the ten may not have been graduated from the Naval Academy seems to be overlooked] average more than forty-four years of age, the same Board should designate ten per cent. of the commanders for the reserve list.

Each member of the Board of five rear-admirals herewith recommended shall swear or affirm that he will without prejudice or partiality, and having in view solely the special fitness of officers and the efficiency of the naval service, perform the duties imposed upon him by this section. Its findings, which shall be in writing, to be signed by all members, not less than four governing.

On the 30th June, when the senior ten lieutenants *in order of consecutive graduation from the Naval Academy* [in this passage the contingency that some one or more of the ten may not have been graduated from the Naval Academy seems to be overlooked] average more than thirty-seven years of age, similarly a Board of five captains, to be organised and governed by the same oath and form of procedure as the Board of five rear-admirals already mentioned, should designate ten per cent. of the lieut.-commanders for the reserve list. In computing these percentages, all resultant fractions to be excluded.

Officers of the reserve list who have had, at the time of their transfer to the reserve list, thirty years' service *from date of entry at the Naval Academy* [or date of original warrant], should have one promotion contemporaneously with the officer next ahead of them on the sea-going list, but not to the grade of rear-admiral, subject to examination as prescribed by law, provided that promotions on the reserve list from the grade of captain be to the grade of commodore, when he should be retired as commodore on three-fourths pay, and that a rear-admiral, when placed on the reserve list, shall have the rank he then holds and be promoted with the officer next above him on the sea-going list. The grade of vice-admiral should not be treated as the next higher grade for the purpose of promotion on the reserve list or for retirement from the sea-going list.

Officers in grades from which elimination for the reserve list is or may be authorised by law should be permitted to submit applications for such reserve list. The Board authorised to make the list of reservations should prepare its list after reference to the list of voluntary applications, having due regard to the special fitness of officers and the efficiency of the naval service.

9. In order to prevent an excess of officers upon the reserve list beyond the requirements of the duties which they are to perform, it is recommended that an officer who is transferred to the reserve list as captain should be retired as commodore on three-fourths pay of grade when the captain who was next above him on the list of captains becomes a rear-admiral, and an officer who is transferred to the reserve list as commander should be retired as captain with three-fourths pay of grade when the officer who was next above him on the list of commanders is promoted to captain, and that an officer who is transferred to the reserve list as lieut.-commander should be retired as lieut.-commander on three-fourths

pay of grade when the officer who was next above him is promoted to captain. It is further recommended that lieut.-commanders transferred to the reserve list be allowed to voluntarily retire as such on half-pay of grade at the discretion of the President. **United States.**

*It is further recommended that the provisions of the United States Statutes at Large, Vol. 29, p. 361, Chap. 399, prohibiting retired officers of the Navy from holding employment with firms furnishing supplies and war material to the Government be repealed.* [This provision is disapproved.]

Any officer who served with credit as an officer or as an enlisted man in the Regular or Volunteer Forces during the Civil War prior to the 9th April, 1865, otherwise than as a cadet, who may be designated for the reserve list, should be entitled to two promotions on said reserve list contemporaneously with the officer next ahead of him on the sea-going list, subject to the examinations now provided by law, provided that nothing should be construed to entitle said officers on the reserve list to be promoted above the grade of rear-admiral.

10. *The duties for which the officers on the reserve list should not be eligible should be defined by law, and the Board is of the opinion that in time of peace they should not be eligible to duty as chiefs of bureaus, assistant chiefs of bureaus, members of the General Board, commandants of Navy Yards or stations, and such secondary duties on shore as are necessary for the individual professional development and training of officers on the sea-going list.* [This provision is disapproved.]

11. Any commissioned officer of the sea-going list of the line below the grade of rear-admiral who is found physically disqualified for sea duty but is pronounced capable of performing shore duty, should be placed on the reserve list.

*(To be continued.)*

## MILITARY NOTES.

The following are the principal appointments which have been made:— **Home.**

Lieut.-General—Sir J. C. McLeod, G.C.B., to be Colonel of the Black Watch (Royal Highlanders).

Major-Generals—H. N. Bunbury, C.B., from a Brigadier-General, to be a Major-General in charge of Administration. Sir E. R. Elles, G.C.I.E., K.C.B., is promoted to the rank of Lieut.-General. M. de la P. Beresford to be Colonel of the Seaforth Highlanders (Ross-shire Buffs, The Duke of Albany's).

Colonels—C. F. N. Macready, C.B., from h.p., to be an A.A.G. at Headquarters. H. W. Pearse, D.S.O., from h.p., to be an Assistant-Director at Headquarters. C. T. E. Metcalfe, C.B., is promoted to the rank of Major-General. T. D. Pilcher, C.B. (temporary Brigadier General), Commanding 3rd Infantry Brigade, is promoted to the rank of Major-General. W. du G. Gray, C.B., I.A., to be a Major-General. R. J. Scallon, C.B., C.I.E., D.S.O., I.A., to be a Major-General. A. A. Barrett, C.B., I.A. (D.A.G. of a Command) to be Major-General. Sir H. S. Rawlinson, Bt., C.V.O., C.B., from h.p., to be a Brigadier General, to command an Infantry Brigade. C. J. Mackenzie, C.B., from an A.A.G. at Headquarters, to be a Brigadier-General to command an Infantry Brigade. F. T. Henstock, from h.p., is appointed a General Staff Officer, First Grade. G. T. Forestier-Walker, R.A., to be an A.D.C. to H.M. the

**Home.** King. G. P. Bourcicault, to be an Assistant-Director of Supplies and Transport. W. Babtie, V.C., C.M.G., M.B., R.A.M.C., to be Inspector of Medical Services.

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*The Territorial Army.*—A Parliamentary paper was issued on the 8th April consisting of a memorandum by the Secretary of State for War, dealing with certain aspects of the Territorial and Reserve Forces Bill, and giving the following tables showing the war and peace establishments of the proposed field force :—

*Proposed Peace Establishments (Regimental).*

| Arm. | Home and Colonial Regular Establishment (including numbers shown as available on Mobilization in Table I.) | | Army Reserve (normal strength). | Special Contingent. | | Permanent staffs of 66 3rd Battalions in Great Britain. | | Irish Militia, including eight 3rd Battalions. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Officers. | | Men. | |
| | Officers. | Men. | Men. | Officers. | Men. | Officers. | Men. | Permanent Staff. | Special Contingent. | Permanent Staff. | Special Contingent. |
| Cavalry ... ... | 557 | 13,797 | 7,847 | ... | ... | ... | ... | ... | ... | ... | ... |
| Horse and Field Artillery (*a*). | 746 | 16,245 | 17,864 | ... | 20,000 | ... | ... | ... | ... | ... | ... |
| Garrison Artillery ... | 596 | 14,013 | 4,859 | ... | ... | ... | ... | 4 | 47 | 56 | 1,540(*c*) |
| Royal Engineers ... | 669 | 8,481 | 6,094 | ... | 4,000 | ... | ... | ... | ... | ... | ... |
| Foot Guards ... ... | 277 | 7,139 | 7,846 | ... | ... | ... | ... | ... | ... | ... | ... |
| Line Infantry (*b*) ... | 2,455 | 79,120 | 63,370 | 1,518 | 33,000 | 594 (*e*) | 5,016 (*e*) | 96 | 460 | 944 | 14,392(*c*) |
| Army Service Corps... | 458 | 6,366 | 10,452 | ... | ... | ... | ... | ... | ... | .. | ... |
| Army Medical Service | 697 | 4,122 | 2,241 | ... | 3,000 | .. | ... | ... | ... | ... | ... |
| Army Veterinary Service. | 100 | 221 | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Army Ordnance Service. | 232 | 2,201 | 879 | ... | ... | ... | ... | ... | ... | ... | ... |
| Pay and Postal Services and Police. | 202 | 1,314 | 268 | ... | ... | ... | ... | ... | ... | ... | ... |
| Total ... ... | 6,989 | 153,019 | 121,660 | 1,518 | 60,000(*d*) | 594 | 5,016 | 100 | 507 | 1,000 | 15,932(*d*) |

NOTES.=(*a*) The figures for Regular Establishment, Reserves and Special Contingent for this arm have not been finally settled.

(*b*) The Regular Establishment here shown excludes staffs of existing depôts, transferred to staffs of 3rd battalions under the proposed new organization.

(*c*) These are approximate figures, the details of the reorganisation of the Irish Militia not having been finally settled.

(*d*) The Irish Militia will, in future, form part of the Special Contingent, the total establishment being thus approximately 76,000.

(*e*) Establishment per battalion—officers : 1 Major, 4 Captains, 2 Lieutenants, 1 Adjutant, 1 Quarter-master ; total, 9. Non-commissioned officers and men : 1 serjeant-major 2 staff-serjeants, 4 colour-serjeants, 8 serjeants, 61 other ranks ; total, 76.

Home.

*War Establishments.*

| Arm. | Principal units. | Total War Establishment, including details. | | Regulars available on Mobilization. | | | Non-Regulars. | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | From Peace Establishment. | | From Reserve. | | Men. | |
| | | Officers. | Men. | Officers, including Regular Officers in Reserve. | Men. | Men. | Officers. | Special Contingent. | Territorial Army. |
| General Officers and Staff | ... | 307 | 664 | 307 | .. | 664 | ... | ... | ... |
| Cavalry ... ... | 14 regiments ... / 14 squadrons ... | 425 | 10,107 | 425 | 5,864 | 2,073 | ... | ... | 2,170 |
| Horse and Field Artillery | 72 batteries ... | 700 | 29,185 | 665 | 10,390 | 14,726 | 35 | 4,069 | ... |
| Garrison Artillery... ... | 6 heavy batteries | 36 | 1,542 | 36 | 870 | 672 | ... | ... | ... |
| Royal Engineers ... ... | Various ... ... | 262 | 7,468 | 192 | 2,742 | 3,020 | 70 | 1,706 | ... |
| Foot Guards ... ... | 6 battalions ... | 174 | 6,498 | 174 | 3,861 | 2,637 | ... | ... | ... |
| Infantry (Line) ... ... | 69 battalions ... | 2,161 | 77,769 | 2,161 | 28,847 | 48,922 | ... | ... | ... |
| Army Service Corps ... | Various ... ... | 361 | 15,222 | 266 | 4,047 | 9,407 | 95 | ... | 1,768 |
| Army Medical Service ... | ... | 872 | 8,859 | 459 | 2,360 | 2,017 | 413 | 1,584 | 2,898 |
| Army Veterinary Service | ... | 113 | 628 | 60 | 192 | ... | 53 | ... | 436 |
| Army Ordnance Service ... | ... | 74 | 1,583 | 74 | 1,102 | 481 | ... | .. | ... |
| Pay and Postal Services and Police ... ... | ... | 150 | 1,056 | 143 | 652 | 404 | 7 | ... | ... |
| Total ... ... | ... | 5,635 | 160,581 | 4,962 | 60,927 | 85,023 | 673 | 7,359 | 7,272 |

NOTE.—The numbers here shown are those required to mobilize the Field Force according to the latest Tables, exclusive of any provision for waste in the field or home employment.

Bulgaria.

*The Cavalry.*—The new Austrian military journal, *Kavalleristische Monatshefte*, has recently devoted a most interesting article to the Bulgarian cavalry, from which the following information is derived:—

Bulgaria, being a mountainous country, is but little adapted to the employment of the horse, and does not furnish naturally trained horsemen. The men of the Bulgarian cavalry, selected preferably from men of medium height, are hardy, and training is zealously carried out. The corps of officers is young, and is rather deficient of cavalry experience in the higher ranks. Great progress has, however, in this regard been made for some years. As a rule they ride well. The non-commissioned officers leave a good deal to be desired as regards equitation, reconnaissance, and the drafting of reports. The corps of officers is recruited from the Military School at Sofia, to which are sent candidate officers of all

**Bulgaria.** branches of the Service. Candidates for the cavalry only receive special equestrian instruction during the last year of the course. There exists no special permanent Cavalry School, but only courses organised twice a year at Sofia. Every year several cavalry officers are sent to Cavalry Schools abroad.

The horses are in a very satisfactory state. The divisional cavalry (groups of 2 squadrons) are mounted on small, very hardy, Bulgarian horses, well accustomed to mountains. Cavalry regiments not attached to infantry divisions who would be specially employed on the Maritza Plains or in the Valley of the Danube, are mounted on big Hungarian horses, admirably suited for the service required of them. The cavalry is at the present time composed as follows:—

6 groups of 2 squadrons to furnish the divisional cavalry. It is proposed to increase them to 3 squadrons, and to raise 3 new groups in order to attach one to each of the 9 infantry divisions of the Bulgarian Army. As that Army should, in time of war, form 9 army corps of 2 divisions each, thanks to the reserve divisions, the groups of divisional squadrons should each form a 4th squadron, so that each infantry division would have 2 squadrons.

The cavalry of the Army consists of 4 regiments of 4 squadrons each and 1 Guards regiment of 3 squadrons. This last will also be eventually increased to 4 squadrons.

According to the *Kavalleristische Monatshefte*, although the Bulgarian cavalry from a cavalryman's point of view cannot be compared to the cavalries of the Great European Powers, it is, nevertheless, in a very satisfactory condition. It is animated in common with the whole Bulgarian Army, with a marked spirit of progress. It can in any case bear advantageous comparison with all the neighbouring Balkan States, including the Turkish cavalry.

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*Last Lear's Army Manœuvres.*—The last manœuvres were carried out with large units, one side consisting of 30 battalions, 12 batteries, and 8 squadrons, and the other 21 battalions, 9 batteries, and 4 squadrons. *Streffleurs Militärische Zeitschrift* thus criticises the Manœuvres:—

The infantry displayed excellent marching and fighting qualities, although it included reservists of all classes up to the age of 40; it was steady, sturdy, and good humoured. Considerable progress has been made as regards tactics. The attacks were well prepared, and good use was made of the ground; the assault was, however, commenced at too great a distance—sometimes at 600 yards. In the defensive, the infantry displayed remarkable capability; it was skilful at digging trenches where necessary, both rapidly and practically, even during the action. Fire discipline is good.

The artillery has very mobile batteries, and did not hesitate to follow difficult roads. Batteries took up position well, and always under cover of the ground. The ranges, however, were too great—generally from 5,000 to 6,000 yards, and it rarely came to close range.

The fortification works were well executed, from both a tactical as well as a technical point of view. Neither telegraph nor telephone was used to the firing line, but great use was made of flag signalling and of the heliograph.

There was a fairly good regimental transport of mixed composition, viz.: 32 pack animals and 22 wagons per regiment. This transport marched well, even on bad roads.

**Bulgaria.**

These manœuvres of considerable scope, says the above-mentioned Austrian journal, in conclusion, demonstrate once more that Bulgarian troops are capable of excellent work, are well disciplined and trained. With its present composition, the Bulgarian Army is thoroughly prepared for the defensive *rôle* which may devolve on it; with a good chief command it would no doubt be equally capable in an offensive one.

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**China.**

*The Yangtse Army.*—The publication by the Official Gazette of the report, *in extenso*, of the military Inspector-General, Tiehlang, on the troops, the schools and the defences laid down in the valley of the Yangtse, gives a sufficiently clear idea of the military forces of the five provinces of that district: Kiang-Su, Kiang-Si, Ngan-Hwei, Hu-Pei, and Hu-Nan.[1]

Under Japanese influence a real military awakening has been manifesting itself for some time in these districts of Central China; students of universities and of schools drill, recruiting is improving, organisation is becoming uniform by taking as a model the divisional grouping of Pe-Chi-Li. From now to 1922 the five Yangtse provinces should be able to put, progressively, in line 10,000 fighting men each, or altogether an army of 100,000 men; the old troops are disappearing gradually through extinction; the police forces, recruited from the best units of the Regular Army, will be charged with the duties of urban and rural police.

Serious efforts are being made to constitute a corps of officers. Each province will form a preparatory school; two middle schools will be created at Wu-Chang and Nankin; the students of these latter will go, to finish their studies, to the officers' school at Pao-Ting-Fu, at which place the completion of unity of doctrine for military students of the whole Empire will be carried out. Almost all the officers of the Regular Army come from the schools. The proportion of officers of the new formations who have gone through their course of studies in Japan amounts to a quarter of the whole effective; that of officers who have gone through a course in a Japanese regiment, after leaving the Chinese schools, amounts to one-fifth. The field officers are all young and active.

Recruiting is carried out in accordance with the regulations laid down by the Lien-ping-tsu (Department for the Organisation of Army Training). The men of the new formations are better than those of the former ones; a considerable proportion of them possess a rudimentary instruction; obligatory regimental schools exist in every battalion, squadron, and artillery brigade division. The *moral* of the soldiers is raised by means of moral theories and patriotic songs. The training is entirely in accordance with Japanese methods. The armament, equipment, and clothing are in a good way towards becoming uniform. Measures are being taken to augment the output of the arsenals at Hu-Pei and Kiang-Su by the purchase of perfected weapons from abroad.

The whole of the armed force of the five Yangtse provinces show an effective of more than 106,000 officers, men, and coolies (including former troops), of whom about 6,000 are detached for duty outside the provinces. At the present time, allowing that the troops are in full course of reorganisation, there would probably not be available more than 40,000

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[1] No mention is made here of Sze-Chwan, although this province lies in the basin of the Yangtse. It is at too great a distance from, and being without means of communication is unable to actually co-operate its military forces with, those of the other provinces.

China

men fit to take the field against European troops. For the present nothing can be diverted to be sent elsewhere, these forces being required on the spot for local security. In a short time, however, Hu-Pei will be able to detach a complete mixed division by rail to the north, in case of war or if Pe-Chi-Li should become the principal theatre of operations. If, on the other hand, the Yangtse district would have to bear the principal brunt of the enemy, the troops of the five provinces would probably be concentrated, in less than 25 days, on the lower Yangtse; the northern provinces could send, by the Pekin-Hankou railway, a reinforcement of 50,000 fresh troops, the remainder being attached to Pe-Chi-Li and Shan-Tung for garrison duty. This reinforcement could be transported in about 25 days to Wu-Chang, and could join the troops of the lower Yangtse 15 days later. This would thus form, after a delay of about 40 days, a mass of 88,000 field troops ready for action in the district near the mouth of the great Chinese river.

In addition to the Regular field forces (the most interesting to note, with a view to future eventual conflict with other Powers), there exist others of less value for keeping order in the interior, and which would consist, in round numbers, of 62,000 men, about 10,000 of whom are required for the wooden flotilla charged with the mobile defence of the river. This river defence will shortly be carried out by torpedo and gunboats. The fixed defences *échelonedꞏ* along the two banks of the Yangtse are completed towards the mouth of the river by the conjunction of the Northern and Central Squadrons (Pei-Yang and Nan-Yang), under the command of Admiral Yeh.

The Manchu element in the newly-formed troops is grouped into constituted units, the attempts at fusion between Chinese and Manchus not having given the expected results. These units only represent 3,700 men, and is thus a negligible minority with regard to the Chinese forces. In excess of local military efforts, the Yangtse provinces must contribute four million taels (a tael = about 3 shillings) for the maintenance of the northern troops, which will shortly be increased by another million—hence a source for discontent.

The whole military situation of Central and Northern China is greatly changed by the completion of the Pekin-Hankou railway, which is now available for traffic from end to end. Finally, if the Yangtse is slightly behindhand in the work of the military reorganisation of China, great efforts are made to develop the defensive methods, which, according to all appearances, will constitute a force with which it will be necessary to reckon.—*Revue Militaire des Armées Etrangères.*

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Germany.

*Mobile Field Kitchens.*—The German journal, the *Neue Militärische Blätter*, recently published a short article on mobile field kitchens, of which the following is a translation :—

"The feeding of large bodies of troops which will have to be attempted in future campaigns will form one of the problems the most difficult of solution, and all the Powers are endeavouring to find the best answer to that problem. The method hitherto adopted in the various Armies to carry out the feeding of the soldier is most difficult of execution, and is, at the same time, often deleterious to the good preparation of the nourishment. The amount of time and work necessary is especially the cause of anxiety to those actually responsible for the soldiers' messing, for it constantly occurs that the soldier, on arriving at the cantonment, hungry and exhausted after a long march, is often obliged to await his humble repast for hours.

Germany

"The excellent results given by the employment by the Russian Army of mobile kitchens during the war in the Far East determined the Prussian War Department to offer three money prizes (amounting in all to 10,000 marks) to the manufacturers presenting the best models. Thus in February, 1906, a certain number of mobile kitchens of various types were presented to the War Department by private industry. The Brun model of field kitchen had already been experimented with in May, 1902, as regards mobility, under the supervision of officers of the War Department, in the Riesengebirge, in Eastern Prussia, and in the Hartz Mountains; the results were considered most satisfactory. These field kitchens, in the form of carts, were provided, the one with camp kettles containing 170 and the other with kettles containing 300 litres (37½ and 66 gallons). These two types of kitchens were then experimented with during the 1905 manœuvres in two Guards infantry regiments, but were not very greatly appreciated by the men, although the experts declared themselves satisfied with the results.

"In the October number of the *Viertelsjahrshefte für Truppenführung und Heereskunde*, published by the Historic Section, we read, with regard to the feeding of the Russian troops in Manchuria: 'Special care was taken to ensure hot meals to the soldiers, even in the most difficult situations. . . . This result was obtained thanks to the mobile field kitchens. It was especially on days of fighting that these kitchens were more particularly used; they came, under cover of darkness, up to the troops in the first line. In this way it was possible, even during the battles lasting for several days, to issue hot meals to the troops. In addition, the field kitchens prepared the daily meals of the men in the bivouac and on the march. The great fault found with the field kitchens was the lengthening they caused to the columns.'

"In Austria experiments were made during the last grand manœuvres with four different types of mobile kitchens, the capacity of whose camp kettles allowed for the preparation of food for a company. The Austrian staff has not yet made a selection from these types, and experiments are being continued."

In France, says *La Revue d'Infanterie*, the question of mobile kitchens has been studied for many years, and experiments with regard to them have been even carried out during the grand manœuvres. Mobile kitchens may be based on two systems: With the first system it is possible to cook meals not only in quarters but also on the march. The advantage of this system is that several hot meals can be served to the troops on the same day; but its inconvenience lies in the necessity for carrying the fuel necessary for the cooking of the food on the march. According to the second system, the hot meal is prepared when at the halt, and the kettles carrying it are provided with a preparation preventing the food from getting cold. This system has the advantage of dispensing with the necessity for carrying the fuel for cooking the food on the march; but it has the inconvenience of not allowing, except exceptionally, for the preparation of several hot meals on the same day. For the latter system there are many methods to keep the food in the kettles hot. By one, called the "Norwegian method," felt is used as an agent for retaining the heat; by the other method, called the "American," the kettle is protected against the cold by sheets of wood to which a thick coating of a composition of flax and magnesia has been applied.

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Japan.

*Organisation of the Medical Personnel in War.*—A very full and remarkable article on the medical department of the Japanese

**Japan.** Army has recently been published in *Streffleurs Militärische Zeitschrift*, and the following are some of the details given in it with regard to the medical *personnel* of that Army in war :—

In a general way the Japanese medical department is based on the German organisation. The doctors have officers' rank from that of sub-lieutenant to that of general of division. They are recruited from amongst doctors of medicine who have in addition gone through a course at the Military Medical School at Tokio. In addition many civilian doctors are called out as reserve doctors in time of war. The last war showed, says the article in question, that the reserve doctors had difficulty in conforming to the conditions of military life in the field, and that their efficiency suffered in consequence.

The hospital orderlies are taken from intelligent soldiers, and receive a special training in a hospital and in the ranks. The troop *personnel* is included in the transport battalion of each division.

At the Grand Headquarters, in time of war, there is a director-general of the department, chief of the medical department in the field. In each Army an inspecting doctor is responsible for the department, assisted by a doctor and two hospital non-commissioned officers. In each division the chief doctor has under him an assistant doctor, an apothecary and two hospital non-commissioned officers, and is head of the department in the division. Under the Director-General of Railways and Etapes, an inspecting doctor of the department has under him the necessary non-combatant *personnel*.

An infantry regiment of 6 battalions has 6 doctors, 3 hospital non-commissioned officers, 12 hospital orderlies, and 48 stretcher-bearers.

A cavalry regiment has 2 doctors, 1 hospital non-commissioned officer, and 1 hospital orderly.

An artillery regiment of 6 batteries has 3 doctors and 3 hospital orderlies.

An engineer battalion has 2 doctors, 1 hospital non-commissioned officer, and 2 hospital orderlies.

A transport battalion has 3 doctors and 3 hospital orderlies.

Each infantry battalion has a pack horse carrying medicines and stuff for dressing wounds. The regiment also has 12 stretchers. In other branches of the Service they have merely medicines and stuff for dressing wounds.

Each division has a medical company consisting of 2 stretcher-bearer detachments and 1 ambulance detachment. The latter consists of 1 commandant, 8 doctors, 1 apothecary and 3 assistants, 1 administrative officer with 1 secretary, 26 hospital orderlies, the necessary transport *personnel*, and 36 pack horses in all for the ambulance detachment, 11 officers (all mounted), 93 men, and 49 horses. Each stretcher-bearer detachment is split up into 2 sections of 3 squads, and consists of 1 transport officer and 160 men. Thus the total strength of the medical company is 13 officers, 413 men, 51 horses. It has 100 stretchers and all the *matériel* is carried on pack animals.

Each division has also 6 field hospitals, 3 of which are in the battle train, and 3 with the convoys (in practice during the last war each division had only 3 or 4 field hospitals). The field hospital can attend to 200 sick, and it may be split up into 2 sections. It consists of 6 doctors, 1 apothecary, 1 administrative officer, 108 men, with 38 pack horses (the latter to be replaced by wagons when the ground permits of it). Each division also has a *personnel* for the despatch and transfer of sick, a reserve medical *personnel*, and a reserve medical *matériel*. The *personnel*

for the despatch and transport of sick consists of 2 doctors, 1 transport officer, 4 non-commissioned officers, and some men. The *personnel* reserve consists of 7 doctors, 1 apothecary, 1 administrative officer, and 66 men. The *matériel* reserve is under 1 transport officer, 1 apothecary, with 15 men, amongst whom are some men capable of attending to medicines and repairing apparatus.

At the étapes there is a central étape hospital with several branches, and a varying number of étapes hospitals, a central depôt of medical *matériel*, with a number of varying annexes. In the rear are organised reserve hospitals and auxiliary hospitals, in which the Red Cross plays the chief part.

*The Medical Department during and after the Battle.*—About half the medical *personnel* of corps followed the combatants as closely as possible, so as to render first aid; the other half took up a sheltered position a little in rear, and awaited the arrival of the medical company (the first aid dressing station), where the wounded, who either came or were brought in, were put into a fit state to bear ultimate transport. The first aid packet rendered the greatest service by permitting the immediate aseptic dressing of wounds. Officers and men knew thoroughly how to use them; the wounded dressed their wounds themselves or had them dressed by their comrades, taking the greatest precaution not to touch with their fingers that portion of the dressing placed on the wound. The surgeons did not take part in the dressing of wounds in the firing line except in special cases, such as severe hemorrhage, fractures, etc.

The divisional medical company, which corresponds to our ambulance, installed the dressing station at a suitable place. The stretcher-bearers carried there the wounded from the regimental first aid dressing stations, and, when the nature of the ground permitted, from the firing line itself. As a rule once the ambulance dressing station established, the regimental first aid dressing stations ceased to act, and all the regimental medical *personnel* rejoined the fighting line, so as to give immediate assistance there.

The wounded provided with a first dressing proceeded by themselves, if they were able to walk, or were carried by stretcher-bearers, first to the regimental first aid dressing station, where the dressing was looked to and rectified if necessary, and from there to the ambulance dressing station, from whence they were directed to the field hospital. In spite of the considerable number of the stretcher-bearers, requisition had always to be made, when the action was severe, on the Chinese porters for the removal of the wounded from the field of battle to the field hospitals, improvised litters made with two bamboos and plaited straw, and Japanese two-wheeled carts from the regimental transport were used for the conveyance of wounded. In particular was this latter method resorted to by the Guards at the battle of Mukden.

The enemy's fire frequently prevented the removal of the wounded after repulsed attacks. Some wounded men thus remained for 3 or 4 days without it being possible to remove them. From this cause many of the wounded were frozen. The Austrian Major Von Dani quotes a curious example of a cessation of fire to allow for the removal of the wounded. The incident occurred on the 7th March, 1905, during the battle of Mukden, in front of the Japanese Guards. The Russians, in spite of the fire, commenced removing their wounded who had fallen in front of the positions occupied by them, and hoisted Red Cross flags along their entire front. This caused the Japanese General Asada to cease fire, and to also cause his own wounded to be removed, thanks to this species of tacit

Japan. armistice. "This act of the Japanese General," says Major Von Dani, "was most humane, and not without foresight, for he was thus relieved of the care of many of the enemy's wounded. He was, nevertheless, generally blamed for it from a military point of view, because he thus permitted the enemy to recover their *moral*, which had been shattered by his troops."

It has been stated above that the regimental first aid dressing stations ceased to act, and rejoined the fighting line, when the ambulance dressing station was established. Very frequently this was not possible on account of the number of the wounded assembled at the former who could not be abandoned, and whom it would take some time to carry to the latter, and which was not always possible; in other cases the first aid dressing stations were too far from the ambulance dressing station and could not be replaced by the latter.

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*Hygienic Precautions in War.* — The war hygiene of the Japanese was remarkable, thanks to the care directed to sanitary supervision, not only by the doctors, but by the commanders of all ranks. The very strict sanitary precautions and the habitual cleanliness of the Japanese themselves contributed very powerfully to the avoidance of contagious diseases, and also of accidents. The military doctors for their part took the very greatest care in the testing of the drinking water, and in reconnoitring, from a sanitary point of view, the cantonments or bivouacs to be occupied before the arrival of the columns. War hygiene had, besides, been the subject of a special regulation communicated to the soldiers, which pointed out in its preamble that it is the duty of every soldier to keep himself in good health.

Cleanliness is, above all, recommended by that regulation. As hot baths are rare in the field, the soldier should at least wash his hands frequently, and his feet once every day before sleeping, keep his hair short, cleanse his mouth and teeth, rub his armpits and the inside of his thighs, etc., with a damp cloth. The wearing linen should be kept very clean. Boots should be carefully greased, especially in winter. Socks should be frequently changed and dried every time, if possible, when they feel the least damp. Food should be abundant, but care should be taken not to eat or drink to excess. *Water must never be drunk except when boiled;* tea and coffee are particularly recommended as drinks. The moderate consumption of alcohol is admissible; but it must be absolutely avoided when there may be a danger of sunstroke or of extreme cold.

Before marching, boots and socks or stockings should be carefully examined, the whole body washed, food and drink sparingly partaken of, and the men should sleep as much as possible. The want of sleep renders one more susceptible to sunstroke or extreme cold. The best drink to carry on the march is tea. Speaking or smoking when climbing a hill, or when the wind is against one, should be avoided; drink as little as possible, and in all cases when one is very hot the mouth should be first rinsed and very little drank at a time. During halts the clothing should be buttoned up and the head-dress kept on the head; never lie down on damp ground; during long rests thoroughly examine the feet and grease any rubbed parts; if the socks are damp, change to dry ones.

In cantonment or bivouac always dig latrines before the troops arrive, and care should be taken to fill them in with earth from time to time. The straw of the bedding should be dried in the sun as often as possible; lay the excess of tent canvas on the ground inside the tent as much as possible.

Japan.

The best precautions against excessive cold are to grease the exposed parts and avoid damp feet. Sunstroke is especially dangerous for men who have not had any sleep, for men fasting or ill fed; drunkards are particularly liable to it.

The regulation also contains advice for the prevention of epidemic sickness, especially dysentery (avoid uncooked food or drink, keep the hands and linen clean), cholera, small-pox, the plague (avoid small wounds in the hands and feet, destroy rats), malarial fever (protection against mosquitoes). During long stays in cantonments health commissions are formed responsible for the sanitation of occupied localities.—*Streffleurs Militärische Zeitschrift.*

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Russia.

*Organisation of the Bokhara Army.*—The *Razviedtchik* publishes an article on the Bokhara Army, from which the following information is derived :—

It is only during the last 20 years that the Bokhara Army has been given its present organisation. Formerly the soldiers who formed the guard of the Emir and of the various Beys constituted a special class, receiving pay but entirely without organisation. It was only in war time that they formed any semblance of corps of troops. After the subordination of Bokhara to Russia they were given a more regular organisation, and by special convention with Russia in 1876, the effective of the Army was fixed at 10,000 men. At the request of the Emir, Russia supplied instructors, officers and non-commissioned officers, for the organisation and training of the troops, who returned to Russia when they had accomplished their task.

At the present time the Army, 10,000 men, consists of 10 battalions of 4 companies each, 2 sotnias of Guards cavalry, 1 battery of Guards horse artillery of 4 guns, and about 300 artillerymen, forming several Irregular sections. The uniform of the infantry is similar to the Russian, with red trousers like the Turkestan troops, high boots and low sheepskin cap. In summer the men wear a cotton blouse and the officers the cotton tunic of the Russian officers. The armament consists of Russian percussion muskets of the year 1850; the two sotnias are armed with a sword and a Berdan carbine. The horse artillery battery is armed with 4 Q.F. mountain guns, given by the Emperor to the Emir in 1904. The cavalry horses are brown bays of Kirgese or native breed, and from 11 to 11½ hands high. There are in the villages of Bokhara, Varchab, Hisar, Faizabad, Kola, and Khoumba detachments of Irregular artillery, who have smooth-bore guns of Persian model of the end of the 18th century.

The officers are selected from among the men and from employés in the Emir's Palace. No educational conditions are required, and a large proportion of them cannot read. The Guards are quartered at Kermine, the residence of the Emir, and the remainder of the Army is distributed amongst the various towns of Bokhara, at the entire disposal of the local Beys (Governors), in the proportion of one or two companies per town. The men are lodged in barracks, 5 or 6 in a room. The men receive 20 *tengas* (about 6s. 6d.) a month for pay, and ration allowance. Officers get from 15s. to £2 10s. a month, and sometimes receive presents from the Emir or the Beys. The clothing of the officers and men is provided by the Government, but it has not any particular period of duration, and its renewal depends on the Commander-in-Chief. One cartridge a year for each man is allowed for musketry instruction. The horse artillery battery carries out one practice with blank ammunition every year. The troops have neither supplies, magazines, nor transport.

**Russia**

Recruiting is carried out by enrolling men who have committed some crime. These serve in the Army until their death, with rare exceptions. Thus children of 14 and 15 years of age may be found serving alongside with old men of 60 and 70.

Training is limited to the handling of arms and to marching in deployed formation. All words of command are Russian. Drill takes place in all towns on market days, viz., twice a week. A band consisting of drums, fifes, and bugles play during the entire drill. The rest of the time the men are employed in various Government works, according to the orders of the Beys.

The insufficiency of the pay compels all soldiers to have some other lucrative occupation; uniform is therefore seldom worn except at drills, and it is not uncommon to see an officer and one of his men in the same shop associated in the same commercial pursuit. The relations between officers and men are of a patriarchal character. Officers present themselves daily before the Bey to salute him, and are then free to dispose of their time. Up to the rank of lieutenant inclusive, the officers are selected by the Beys; they are promoted from that rank by the Emir. The disciplinary punishments are: imprisonment with wooden fetters and beating. In a general way this Army gives the impression of an opera bouffe—one with its absence of proper uniform and the fantastic dress of the officers.—*Revue Militaire des Armées Etrangères.*

# CORRESPONDENCE.

## THE NEEDS OF SHORE ANTI-TORPEDO-BOAT DEFENCE ARE NOT NECESSARILY THE NEEDS OF NAVAL ANTI-TORPEDO-BOAT DEFENCE; OR, WHY DISCARD THE 12-PR.?

*To the Editor of the* JOURNAL OF THE ROYAL UNITED SERVICE INSTITUTION.

SIR,—There is a very prevalent notion that when a new gun is made, coast defences do not benefit by it until every ship in the Navy worth re-arming, and in which it is possible to put it, has been supplied and a due reserve organised. There may be, and indeed should be, a great deal of truth in this, but it by no means follows that every gun issued to the Navy is equally necessary for coast defence. At the present moment the 12-pounder is being rendered obsolescent for anti-torpedo-boat defence by our own and foreign Navies, and guns throwing a heavier projectile substituted. It is on all sides being assumed that the 12-pounder is also obsolescent for coast defence, and that as soon as the Navy has been supplied with the new gun the coast defences will get it; that if they don't get it, it will be on the score of expense, and that meanwhile the anti-torpedo-boat defence is not of much account.

This is a very false idea. I wish to prove this, principally by showing that the conditions under which the Navy and coast defence work are totally dissimilar, and then explaining the stopping powers of a 12-pounder mounted for coast defence.

To begin with, a fleet of battle-ships or squadron of cruisers are nowadays liable to be attacked by destroyers and torpedo-boats—but

*principally destroyers*—at any time of day or night in the open sea. Torpedoes can now be fired at such long ranges and so much more accurately than formerly, that the boats must be disabled as far away as possible. On the other hand, anti-torpedo-boat guns on land will not be themselves the object of attack; *boats* will more often be used than destroyers, and in most cases the attacking boats are bound to come under the close range of the defence.

Here we have at once very dissimilar conditions; however, for some years now both Services have had the same gun, viz., a 12-pounder.

We might now take note of the incomparably greater difficulties that the Navy labours under when dealing with an attack by torpedo craft than the coast artillery do, thus showing how the former cannot hope to obtain the same results as the latter.

1. Naval guns are not fitted with auto-sights. As ships can be divided into two classes, viz., those propelled by steam and others, so might anti-torpedo-boat guns be divided into two classes, viz., those fitted with auto-sights and others. Without going into any detail, I might explain here what an auto-sight is. It is a sight such that the gun to which it is fitted will hit any object that the sight points at. There is no sight setting or ranging. All that is required is for the layer to aim at the target and the gun will hit it.

In the case of a light Q.F. gun, when one wants to get as many hits as possible in a very limited space of time and to start hitting with the first round, it is easily seen that a gun with such a sight is infinitely superior to a gun without one. One 12-pounder fitted with an auto-sight is probably equal to three without them.

2. The gun's platform on a ship is never as steady as on land.

3. Not only has the speed of the target to be taken into account, but the speed of the ship on which the gun is.

4. The height a ship's gun is mounted above the water is always considerably less than one on land. This involves two disadvantages, viz., inaccurate laying is much more fatal, even taking into account the greater permissible error, and the lower you are the more difficult is it to see, especially at night.

5. The man behind a ship's gun is in greater danger than the man behind the gun on land. At sea, the ship is the boat's objective, and if not defeated, the boat may sink the ship. This must affect the nerves of the men shooting unfavourably. The battery on land is not the boat's objective, and the danger from the boat's guns is *nil*.

6. A ship may be attacked in any direction. A battery on land knows in most cases the direction from which an attack may be expected, and schemes for distribution of fire can in the latter case be more easily drawn up.

The above six points, the first of which is by far the most important, all tend to show that, given the same gun, the same good organisation, and the same well-trained *personnel*, the anti-torpedo-boat gun mounted on land is an infinitely better fighting unit, and would give a far better account of itself than a similar one on a ship. It is no exaggeration to state that their relative values are at least 5 to 1. In addition to this, the ship's gun will have to deal generally with destroyers, and will want to defeat the boat, whatever it is, as far away as possible,[1] whilst the gun

[1] The range at which this can be done at night is, of course, limited by the power of the ship's search-lights, which at present are less powerful than those on land.

on land will have to deal generally with torpedo-boats, and the attacking craft will be compelled to come under close range fire.

For the Navy, then, it will be seen how very difficult it is to obtain hits at night, and it follows that it is essential that every hit should be a knock-out, and that therefore if a gun throwing a heavier projectile without unduly sacrificing the necessary rapidity of fire, can be mounted in equal numbers instead of a lighter gun, it should be done. I think then the reason for the Navies of the world adopting a heavier anti-torpedo-boat gun are clear.

We might now enquire into whether 12-pounders are good enough for coast defence if hits can be obtained at night at the required ranges.

It was originally adopted as an anti-torpedo-boat gun after trials at Shoeburyness against a torpedo-boat in 1894. This may seem a long time ago, but why should not the conclusions then arrived at still hold good? The gun is the same, and the modern French torpedo-boat is the same size, more or less, as the torpedo-boat in vogue in 1894, but being faster and consequently having more engine space, is more vulnerable. France has launched over 90 of such boats since 1904 (*inclusive*).

There have been trials at a destroyer since 1894, but this affects the Navy more than the coast defences.

The pith of the conclusions then arrived at was that a shell from a 12-pounder would almost always disable a torpedo-boat. A destroyer would take a little more stopping, but its sides are just as weak; it would form a target hardly to be missed, and it would not be so easy to manœuvre. There may, of course be reasons founded on the late war which have led to the discarding of the 12-pounder by the Navy. Reliable information is scanty, but putting together the various accounts, the evidence in a negative way seems to point in the other direction. The following seem correct deductions :—

1. In no case did any Japanese torpedo-boats or destroyers attempt to enter Port Arthur or Vladivostok in order to torpedo ships inside, and yet each harbour, especially Port Arthur, was full of the most valuable prizes. The light Q.F. guns were, then a sufficient deterrent.

2. No boat of either side came under the fire of anti-torpedo-boat guns mounted on shore.

3. The Japanese boats and destroyers nearly always kept at long ranges, and so were rarely ever hit.

4. That when they did come into close ranges, as at the attack on the "Sevastopol" and in the battle of the Sea of Japan, they lost boats sunk by gun fire, and that, in spite of the inefficiency and want of training on the part of the Russian gunners and their faulty ammunition.

5. The Russians lost several destroyers sunk by the gun fire of the Japanese destroyers, *i.e.*, were sunk by 12-pounders and 3-pounders.

None of the above conclusions point to the 12-pounder being found wanting,[1] and it is probable, as I have previously said, that the real reason for it being discarded is the long range and greater accuracy of the modern torpedo, making it probable that in the near future destroyers may attack by day, but in any case making it necessary to put the boat out of action at as long a range as possible.

This does not apply to the land, and there seems to be no reason why the conclusions arrived at in 1894 should not still hold good for coast defence purposes.

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[1] This doubt as to the 12-pounder being found wanting is also mentioned in Brassey.

It will now be interesting to see how the gun on land stands in relation to a boat, *i.e.*, how many guns are wanted to deal with one boat, or how many boats can be dealt with by one gun.

In no branch of either Service can peace practice be made so like the real thing as the peace practice as at present carried out by the Royal Garrison Artillery.

Search-lights are working, detachments are under cover and cannot see the approach of the target, guns are loaded, ammunition put ready, and everything is silent in the fort.

Suddenly the alarm is sounded, detachments take post on their guns, the targets are seen in the search-lights rushing in between 20 and 30 knots an hour, fire is opened and kept up until stopped by the Chief Umpire. "Oh, but," one will say, "there's no one shooting at the guns; results would then be very different." Not so. I venture to say a man would be as safe in that battery being fired at from torpedo-boats as he would be in the streets of London. Only think of the aim taken by the men in the boats, men being carried swiftly to almost certain destruction, knowing that if they get into the harbour they will never get out, exposed to a deadly fire, blinded by search-lights, and with a target well above them at an unknown range. The gunners on shore would understand this, and their shooting would be hardly affected; but even if results would not be quite so good on this account, there is far more compensation afforded by the target being so much more visible and easy to lay on than the peace target. Although the actual hits are worked out with reference to a larger target, the actual target aimed at by the gun-layer is so small *that he cannot see it*, and has to lay on the splash it throws up. I think, then, we may certainly take it that the results of peace practice will hold good in war time.

What are the results? They work out to 4 hits per gun per minute. This is taken from the practice of different companies, both good and indifferent. They are absolutely reliable, as in nearly all cases the practice was carried on under the *ægis* of the School of Gunnery, who are there to see that the regulations are strictly complied with, and that the recording of the results are correct.

But these 4 hits per minute are only worked out in reference to a target 60 feet long, 4 feet freeboard, and 9 feet beam, whereas an average French torpedo-boat is 125 feet long, 4 to 4½ feet freeboard, and 14 feet beam. The 4 hits per gun per minute would easily become 5 on this larger target.

Now, in a well-defended fortress a fast boat will be at least a minute and the average boat more like a minute and a quarter to a minute and a half under fire, so that we may say definitely that a gun will make at least 5 hits on boats running in.

Now, as we have previously seen that the Ordnance Committee at the Shoeburyness trials in 1894 came to a conclusion that a hit from a 12-pounder would almost always disable a torpedo-boat, and we have found nothing to contradict this since, is it optimistic to say that 5 hits will disable two torpedo-boats whilst running in? I think not, as there is 150 per cent. to spare.

If these conclusions are correct, then there is nothing wrong with the 12-pounder from a Coast Artillery point of view. I don't mean to say that better results would not be obtained from an equal number of 4-inch or 4·7-inch guns, if the extra money necessary for practising with them were granted, but if the 12-pounders are good enough and will stop boats, why go to the expense of substituting other guns? And—here is the

danger—too few guns of the heavier nature may be substituted, perhaps, on the score of expense.[1]

I think that the 12-pounder in its present hands (the R.G.A.) will do what it is intended to, and there is no need in this case to copy the Navy.

A. E. C. MYERS, Captain, R.G.A.

*The Citadel, Plymouth, 14th February, 1907.*

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# NAVAL AND MILITARY CALENDAR.

## MARCH, 1907.

2nd (Sat.) 3rd Bn. Northumberland Fusiliers arrived in England from South Africa, in the "Braemar Castle," to be disbanded.

5th (T.) Prince Henry of the Netherlands was invested with the Order of the Bath.

7th (Th.) Launch of second-class cruiser "Stettin," from the Vulcan Yards, Stettin, for the German Navy.

11th (M.) 2nd Bn. Royal Sussex Regiment arrived in Ireland from Crete in the "Sicilia."

12th (T.) French first-class battleship "Iéna," blown up in dock in Toulon.

16th (Sat.) Launch of first-class armoured cruiser "Indomitable," from the Fairfield Shipbuilding Company's Yard, Clydebank.

17th (S.) H.M.S. "Aboukir," left Plymouth for the Mediterranean.

20th (W.) H.M.S. "Queen," left Portsmouth for the Mediterranean.

23rd (Sat.) France obtained three large Siamese provinces by a treaty with that country.

24th (S.) A Frenchman was murdered by natives in Marrakesh, Morocco.

25th (M.) France adopted vigorous measures with regard to the Frenchman murdered by natives in Morocco.

26th (T.) France seized Ujda, Morocco.

" " Civil War in Roumania, fighting between troups and peasants.

" " H.M.S. "Albion," fully commissioned at Portsmouth for Atlantic Fleet.

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[1] As an illustration of this, I am told that at a certain harbour it has been proposed to do away with six 12-pounders, and on approximately the same site mount two 6-inch guns. This can be the outcome of but two lines of thought, both of which must be wrong. The first would be that torpedo attack is no longer feared there, and the 6-inch guns are mounted for some other purpose. The answer to this is, that the reason torpedo attack is not likely is the presence of the 12-pounders. The second would be that the 6-inch guns are to be substituted for the 12-pounders; if the latter supposition is correct, the fears expressed above are indeed well founded.

# FOREIGN PERIODICALS.

## NAVAL.

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BRAZIL.—*Revista Maritima Brazileira.* Rio de Janeiro: November, 1906.—"A Uniform Spirit in the Management of Naval Affairs." "Naval Strategy." "Evolution and Tactics of Artillery and Landing Operations." "The Fittings of a Gun." "Defence of Coasts and Harbours." "War and Law." "On the Fishing Industry." "On the Instruction of Artillery *Personnel.*" "On the Bay and Bar of Tutoya."

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# NOTICES OF BOOKS.

*The Canadian War of 1812.* By C. P. Lucas, C.B., Clarendon Press, Oxford, 1906. 260 pages.

Mr. Lucas justly states that the British Empire owes a great debt to the somewhat depreciated War of 1812, and we must attribute the general neglect of the war on the part of our historians, partly to the fact that, during its progress, it aroused but little national interest or sympathy, and partly to the humiliating memory of the disaster at New Orleans, which was the last important incident of the war.

As far as England is concerned, the view generally taken of the War of 1812 is, briefly, that it was an unnecessary and unpopular campaign, forced upon the country at a time of national danger, and terminating with the repulse at New Orleans, an incident which can hardly be looked upon but as a national disgrace.

Nor have the United States much more cause to look back on the war with satisfaction. The responsibility for its inception was entirely theirs; the work, it is true, of the anti-English party alone, whose desire it was to take advantage of the difficulties of England, and, by attacking her while in the throes of her great struggle with Napoleon, to effect the capture of Canada, and so to eliminate the English factor from the mainland of North America.

To reproach the United States, on account of this policy, would, perhaps, be futile; national policy is rarely chivalrous; yet it may do a service both to Great Britain and to the United States, to call the attention of the students of both nations to Mr. Lucas's instructive book, in whose pages may be read the story of how, in 1812, the war-party of the United States attacked Canada at a moment when, as they thought, England could do little to help her, and how they failed in their attempt.

The war was, in fact, really one of three combatants, for Canada, guiltless of the cause of quarrel, was the scene of its earlier actions; and Canada alone is entitled to look back to 1812 with unmixed satisfaction.

It is true that the scanty English garrison did its duty manfully and well, and that in General Isaac Brock our Army lent Canada one of its most brilliant commanders, but still, Upper Canada was mainly defended by the stout hearts and strong arms of its loyal Colonists against the largely superior forces of the United States, and long as the struggle lasted, and heavy as were the demands on Canadian loyalty and determination, both proved equal to the strain.

The conditions of the war are ably set forth by Mr. Lucas, and, perhaps, the most striking circumstance detailed in his pages is the contrast between the success of our arms during the operations of the first year of the war, and their lamentable failure at its termination.

In 1812, all the conditions were in favour of the United States. Practically the whole English Army was engaged in the Spanish Peninsula, while the anxiety of the British Government to keep the peace with the United States had led to a dangerous reduction of our naval strength in American waters. Yet the events of the first year of the war were an unbroken series of British successes. In the month of January, 1815—the last of the war—on the other hand, the termination of the Peninsular War had enabled our Government to attack New Orleans with a considerable force, certainly stronger than anything that the United States

could oppose to it; yet the result was one of the most humiliating repulses in our military annals.

Mr. Lucas's book, intended, as the author tells us, to be an instalment of Canadian history, deals principally with the abortive American invasion of Upper Canada, and the other operations near the Canadian Frontier, the narrative of the later events of the war being but a brief sketch. Yet the book is very interesting, and supplies a lucid and, in parts, spirited record of many little-known incidents well deserving of study.

History, as we know, has a habit of repeating itself, and the story of 1812 should not be forgotten. Then, as now, Great Britain had every wish to be on terms of peace with the United States, and, being already at war with France, was most reluctant to commit herself to fight a second and a formidable adversary. Then, too, as now, the more thoughtful and moderate section of public men in the United States was opposed to war with the Mother-country, realising that the actions of the British Government, which formed the pretext for the quarrel, had been forced upon England by the nature of her death-struggle with Napoleon. Yet the wishes of the war-party prevailed at Washington, as they may again prevail on some future day of England's difficulty. There is not an Englishman who does not earnestly hope that the war of 1812 may be the last between the two English-speaking nations, yet good wishes have but little effect in averting war. Far more efficacious would be the existence of a sound and thorough organisation for defence throughout the Empire, ensuring the prompt concentration of the national resources at any threatened point.

In Canada also, Mr. Lucas's book must encourage resolutions for the future, as well as pride in the achievements of the past. As he well says:—"The firm and patriotic action of her sons in 1812, demonstrated to the world that Colonial liberty and Colonial patriotism did not leave the British Empire when the United States left it. The same spirit which had inspired and carried to success the American War of Independence, was now enlisted on the side of Great Britain." To-day, as in 1812, Canada is at once the most vulnerable of the British Dominions beyond the sea, and the most interested in the maintenance of the union of the Empire. Her readiness to take up the quarrels of the Mother-country was shown to all observers in 1899, and they who learned the fighting qualities of the modern Canadian in the South African War, and witnessed the readiness of Canada to bear her share of the dangers and burdens of the Empire, need have no doubt that, if again attacked in her own territory, Canada will once more defend herself as stoutly and as successfully as in 1812.

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## PRINCIPAL ADDITIONS TO LIBRARY, MARCH, 1907.

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*Regulations for Mobilisation, 1906.* Official. Crown 8vo. (Presented.) (Harrison & Sons.) London, 1906.

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*Captain John Smith's Travels.* By Captain John Smith. 2 vols. 8vo. 25s. (James Maclehose & Son.) Glasgow, 1907.

*Sketches in Mafeking and East Africa.* By Major-General R. S. S. Baden-Powell. Oblong 4to. 21s. (Smith, Elder & Co.) London, 1907.

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*Signs and Portents in the Far East.* By Everard Cotes. 8vo. 7s. 6d. (Methuen & Co.) London, 1907.

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*British North America.* By C. Hill Tout. 8vo. 6s. (Archibald Constable & Co., Ltd.) London, 1907.

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*Der Kampf um die Vorherrschaft in Deutschland, 1859 bis 1866.* By H. Friedjung. 6th Edition. 2 vols. 8vo. 25s. Berlin, 1904.

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*Narrative of the Second Sikh War in 1848-49.* By E. J. Thackwele. 2nd Edition, revised. Crown 8vo. (Richard Bentley.) London, 1851.

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*La Guerre Russo-Japonaise.* By Chef d'Escadron R. Meunier. 8vo. 12s. (Berger-Levrault et Cie.) Paris, 1906.

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*Letters from the Far East.* By Sir C. Eliot. 8vo. 8s. 6d. (Edward Arnold.) London, 1907.

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*The Truce in the Far East and its Aftermath.* By B. L. Putnam Weale. 8vo. 12s. 6d. (Macmillan & Co., Ltd.) London, 1907.

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